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Construction Methods

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SEPTEMBER 1940

HIGH SPEED CONSTRUCTION expands factory to produce machine tools for national defense.

★

TALL STEEL TOWERS erected to carry floodlights for night baseball.

★

CANADA'S FIRST SUPERHIGHWAY is 91-mi. concrete-paved Queen Elizabeth Way.

★

AIRPORT RUNWAYS paved with slag-asphalt on drained clay subgrade.

★

RAPID TUNNELING drives 6-mi. bore in rock for draining gold mines.

★

MASS HOUSING PROJECT produces 607 dwelling units at low cost.

★

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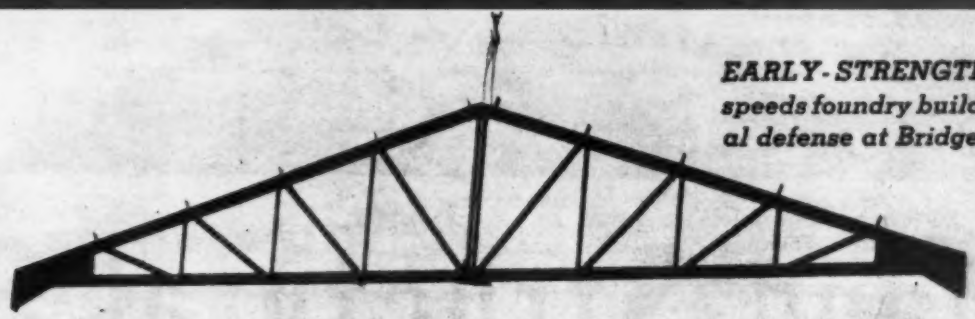

***EARLY-STRENGTH CONCRETE** speeds foundry building for national defense at Bridgeport, Conn.*

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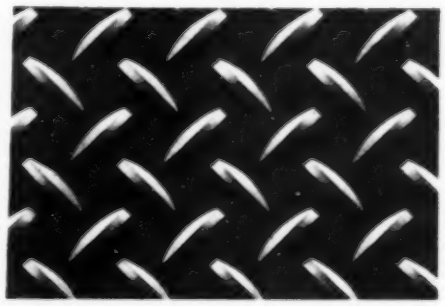

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CURRENT JOBS

....and Who's Doing Them

BUILDINGS

Public—Successful bidders for waterfront buildings and new marine railroad at Submarine Base, New London, Conn., were **F. H. McGraw & Co.**, of Hartford, and **Spearin, Preston & Burrows, Inc.**, of New York City, for $2,303,000 on cost-plus-fixed-fee basis. **Charles W. Angle, Inc.**, of Greensboro, N. C. received contract to build barracks, temporary housing, storage and aviation facilities at Marine Barracks, Parris Island, S. C., for $2,394,750 on cost-plus-fixed-fee basis. In Brooklyn, N. Y., **Walter Kidde Constructors, Inc.**, of New York City, will erect at the New York Navy Yard sub-assembly shop, steel storage runways and shop building improvements for $1,520,000 on cost-plus-fixed-fee basis. **Manhattan Construction Co.**, of Muskogee, Okla., was awarded contract to build 44 standard ammunition magazines in Savanna, Ill., for $1,452,850. National Defense housing project, comprising 424 units, will be constructed at Maxwell Field, Montgomery, Ala., by **Algernon Blair**, local contractor, for $1,113,980. **United Engineers & Constructors, Inc.**, of Philadelphia, Pa., received contract to improve power plants at Navy Yards in Philadelphia, Pa., Charleston, S. C., and Marine Barracks, Parris Island, S. C., for $1,260,000 on cost-plus-fixed-fee basis. In Brooklyn, N. Y., the **Cauldwell-Wingate Co.**, of New York, will construct foundations, superstructures and appurtenances for Kingsborough Houses at cost of $3,013,000. At Navy Yard in Philadelphia, Pa., **Hughes-Foulkrod Co.**, local contractor, received contract to construct electric shop, dispensary extension, ship fitters shop, shipways and crane runways for $855,000 on cost-plus-fixed-fee basis. Barracks at Norfolk Naval Base, Norfolk, Va., will be built by **Virginia Engineering Co.**, of Newport News, for $800,000 on cost-plus-fixed-fee basis.

HEAVY CONSTRUCTION

In Hartford, Conn., **A. I. Savin Construction Co.**, local contractor, will erect central dike for Connecticut River front for $1,618,467. Contract for widening, deepening and realigning channel of Codorus Creek in York, Pa., went to **Benjamin Foster Co.**, of Philadelphia, for $1,631,373. **Arundel Corp.**, and **Consolidated Engineering Co.**, of Baltimore, Md., received contract to construct aviation facilities at Naval Air Station, San Juan, P. R., and Charlotte Amalie, Virgin Islands, for $3,272,000. At McDill Field, Tampa, Fla., **Central Contracting Co.**, of Atlanta, Ga., will erect structural steel hangars for $1,065,500. **A. W. Robertson, Ltd.**, of Toronto, Canada, was awarded contract to build 21 buildings for service-flying training school in Kingston, Ont., Canada, for $750,000 on cost-plus-general contract. Enlarging naval air station at Kodiak and constructing new base at Unalaska, Alaska, will be undertaken by **Siems-Drake-Puget Sound Co.**, of Seattle, Wash., for total of $4,093,000. Successful bidders for contract for auxiliary landplane naval base in Green Cove Springs, Fla., were **G. D. Auchter Co., Duval Engineering & Contracting Co.**, of Jacksonville, and **Batson-Cook Co.**, of West Point, Ga., for $1,800,000 on cost-plus-fixed-fee-basis. Construction of airport in Macdonald, Manitoba, Canada, is under way by **Tomlinson Construction Co., Ltd.**, and **Manitoba Engineering Co. Ltd.**, of Winnipeg, Canada, for $800,000.

HIGHWAYS AND BRIDGES

Among recent highway and bridge contract awards are the following: California: $205,836 to **Biasotti & Son**, of Stockton, and **L. D. Tonn**, of Lodi; $216,772 to **Basich Bros.**, of Torrance. Georgia: $189,619 to **Clausen-Lawrence Construction Co.**, of St. Augusta. Illinois: $219,167 to **John Mackler & Co.**, of Chicago Heights. Louisiana: $200,818 to **T. L. James & Co., Inc.**, of Ruston. Michigan: $267,679 to **C. G. Bridges**, of Excanaba. Missouri: $547,772 to **Fred Weber, Jr.**, of St. Louis, and **Atkinson Windle Co.**, of Chillicothe. New York: $1,068,871 to **B. Turecamo Contracting Co.**, of Brooklyn. Oregon: $205,704 to **Henry L. Horn**. Ohio: $543,410 to **Carl Myers**, Campbellsburg, Ind.; $793,378 to **Lombardo Bros. Construction Co.**, of Cleveland. Texas: $401,208 to **Texas Bitulithic Co.**, of Dallas. Quebec, Canada: $275,302 to **H. J. O'Connell Ltd.**, of Montreal, Canada. Contract for replacing bridges on main line railroad between New York state line and New Haven, Conn., went to **G. F. Collins Co.**, of New York City, for $1,250,000. With bid of $2,298,895 **Chas. F. Vachris, Inc.**, of Brooklyn, N. Y., received contract for track elevation at Rockaway, N. Y. **P. Tomasetti Contracting Corp.**, of Brooklyn, N. Y., was awarded grade elimination contract in Brooklyn, N. Y., for $2,936,514. Contract for superstructure bridge approach spans for Rainbow Bridge over Niagara River, Canadian side, went to **Aiken & McLachlan**, of St. Catherines, Ont., Canada, for $229,940. **Great Lakes Dredge & Dock Co.**, of Chicago, was awarded contract for bridge over Illinois River at Peoria, Ill., for $589,415.

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N. A. Bowers (San Francisco) Nelle Fitzgerald
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The HOW of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How **CREEPER CRANES** erected steel for 460-ft. high cableway head tower. — p. 39

How **EARLY STRENGTH** cement aided high-speed construction of foundry of manufacturer producing machine tools for national defense. — p. 42

How **BOOM AND JIB** on crane with over-all reach of 125 ft. set steel across 94-ft. width of building. — p. 43

How **FLOATING PIPE POLE** erected 150-ft. steel towers for night baseball floodlights. — p. 46

How **BANKS OF FLOODLIGHTS** for night baseball lighting were mounted on structural steel cross-arms. — p. 47

How **EXPRESS HIGHWAY** involving 50 bridges was constructed over 91-mi. route in Canada. — p. 48

How **AIRPORT RUNWAYS** were surfaced with slag-asphalt on drained clay sub-grade. — p. 50

How **SPREADING AND TAMPING** of fill was done with tractor-bulldozer on which sheepsfoot tampers were fastened to track plates. — p. 54

How **ELECTRIC POWERED BULLDOZER RIG** cleaned up tunnel muck for loading. — p. 54

How **CONCRETE GUNS** placed lining in tunnels for railroad relocation. — p. 54

How **HAND HOIST RIG** delivered roofing materials in bundles on housing project. — p. 54

How **AUTOMATIC PIPE DETECTOR** enabled operator of crane or shovel to avoid striking obstructions underground. — p. 55

How **TRANSFER OF CONCRETE PAVING EQUIPMENT** was effected by tractor-drawn sled. — p. 55

How **ABSORPTIVE FORM LINER** on dam construction produced harder, denser, and smoother concrete. — p. 55

How **MASS PRODUCTION METHODS** cut costs of concrete houses for California project. — p. 56

How **CONCRETE JOISTS** for mass housing project were precast in specially equipped yard. — p. 56

How **WOOD PANEL FORMS** are designed and used on big concrete dams. — p. 62

How **SPEEDY TUNNELING PROGRESS** was maintained on 6-mi. bore for mine drainage. — p. 65

How **STEEL JUMBO** carried drills for rock tunneling. — p. 65

How **"CHERRY PICKER"** shifted muck cars on 6-mi. rock tunnel. — p. 66

How **SMALL TOOLS** helped cut and assemble wood roof trusses. — p. 68

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CHALLENGE TO INDUSTRY'S PATRIOTISM

calls for Plain Speaking

IT is a pity that the greatest national defense effort in American history had to be made during a presidential election campaign. For a modern defense effort involves an intensely practical industrial project, while an election campaign involves an intensely emotional political propaganda. And those two don't mix.

That, as I see it, is the chief reason for the welter of claims and denials, charges and counter-charges that have been getting in the way of contracts for planes, tanks, guns and all the rest of the armament for which the American people are so nervously peering down the road.

We are told that the managers of industry, smarting and suspicious under the repeated attacks of government officials for some years back, have been reluctant to assume the abnormal risks of defense contracts without commensurate safeguards, and that the politicians who must authorize those safeguards have been reluctant to do anything that might be construed as letting down the bars for unscrupulous business men to exploit the national emergency. For the one, the business risks of full speed ahead have been too great; for the other, the political risks of full speed ahead have been too great. So we don't go full speed ahead.

This is not written to increase that clamor of recrimination on either side. On the contrary, it is an appeal for some decent and thoughtful consideration on the part of all concerned—consideration for the urgent needs of the nation, for the problems and responsibilities of both the politicians and the industrialists, for the elementary principles of prudent business management, and for the good opinion of the man on the street. He is neither a politician nor an industrial executive. But his hide and his pocketbook are at stake in the national defense program—and he knows it. He has a right to the low-down on what is going on. And if he is left in ignorance or deliberately deceived, for the sake of either political or business whoopee, the payoff will be mighty poisonous political medicine for the politicians and equally poisonous business medicine for the business men who may be responsible.

* * *

The plain stark fact, to be faced squarely by us all, is that the national defense program is an emergency project—a desperately urgent emergency project.

As in every emergency that confronts a democracy, we are harassed by a confusion of counsel. As always, some of the confusion arises from honest but conflicting judgments, some of it from ignorance or muddy thinking. But, unhappily, much of it reflects the deliberate purpose of self-seekers to fish in troubled waters—to capitalize the conjunction of a national emergency and a political campaign to boost their own interests. Already the charge that American business men are unpatriotic and interested only in profit has been put out as a smokescreen to cover up deficiencies for which business men are in no way responsible.

Now the man on the street finds it hard to see through this maze of excited contradiction. Not because he isn't smart — the average American can think straight enough *when he has the facts.* But in this case the facts are obscure and complicated—they have to do with matters that are strange to him. And to make it worse, at the height of his confusion, raucous voices constantly assail his ear with "simple" explanations of it all. But, as so often happens, most of these "simple" explanations make the matter a lot simpler than it really is.

* * *

Consider, for example, the cry that "industry refuses to get busy on national defense until its profits are guaranteed". Very clear and simple, to be sure; but also very false. The charge that American capital is "on strike" in the hour of national need. As silly as it is simple. The assertion that our manufacturers "won't even talk with a government anxious to place orders with them, without large financial concessions", and that "American corporate industry refuses to expand its resources for defense until it receives immunity from proper taxation". The resounding demand that we "conscript wealth as well as men"—whatever that may mean.

Particularly political has been the attack on the aircraft industry. It has been made to appear that aircraft manufacturers were instituting a sit-down strike because, in their greed for profits, they demanded more than 8%. Actually the 8% was not a net profit at all and the only concern of the manufacturers was to fight against incurring losses under the 8% limitation. And army and navy officers have sustained the aircraft manufacturers' viewpoint.

The air is full of explanations which however simple they may sound, do not explain. And in most cases, I am convinced, the purpose of those who offer them is not to explain but to inflame. Those who try honestly to explain these issues from either side, find it impossible to do the job in such ringing phrases.

As I have said, our country has been caught short. As a result, there are many reasons for the confusion and controversy. The plain fact is that we can produce our war equipment by only two means: (1) by converting the industries of peace into the industries of war, so far as that is possible; and (2) by building from scratch the new facilities we need to supplement them. In other words, we must create—with desperate haste—a new industry in America—an armament industry.

Right there is the crux of the problem that now confronts the industrialist sincerely trying to equip himself for his part in national defense. For this new armament industry is not the ordinary business risk against which he has learned to weigh the interests of his employees and his stockholders. It does not deal with familiar products and processes. It is not continuous—at least it has not been heretofore in this country—and it may fold up as suddenly as it has opened. It cannot hope to serve thousands of potential customers: it has but one sure customer—the United States Government—and wielding the sovereign power that customer can do just about as it pleases with respect to its needs and demands. Which means that not even this one is a *sure* customer.

* * *

No more unfair or deceptive charge ever has been leveled against American industry and American business men than the accusation of being unwilling to take the normal business risks of the defense program. The risks they are trying to minimize—they cannot possibly avoid them all—are very special and extraordinary risks indeed. So clearly is that true, that I doubt very much whether such questions and charges ever would have risen were it not for the fact we are engaged in a political campaign.

Already some of industry's great units have gone ahead with the building of new facilities, the purchase of special materials, and the actual production of armament in the face of all risks, gambling that their government eventually would work out some reasonable plan to protect them against excessive loss. Others, doubtless will follow suit.

But many other companies, for one reason or another, are not in position to do that. So before they begin to expand their facilities to handle defense contracts, they have asked their *only potential customer for those new facilities* to guarantee them—*not* excessive prices, *not* exorbitant profits, *not* immunity from taxation, as we are being told, but simply against the excessive losses that may result from very extraordinary conditions.

* * *

As this is written, it looks as though the legislation and the rulings necessary to accomplish this purpose soon will be forthcoming. Thoughtful and responsible officials of the government understand the situation and what is needed. But, unfortunately, their understanding and action will not quiet the professional business-baiters. So long as those gentlemen have their own interests to serve, so long as political excitement makes it easy to whip up public demand for a scapegoat to atone for disappointing progress with the defense program—just so long will the business-baiters find a receptive audience for their criticisms.

All of which suggests that business men must carry at this time a double responsibility, in addition to their obvious obligation to do the very best job they know how on their individual parts of the defense program.

The first of these added responsibilities is, of course, to avoid any possible basis for the charge that industry is exploiting the defense program in behalf of excessive profit, unfair treatment of labor or any other unworthy self-interest The second is to see that the man in the street knows and understands all that I have tried to set down in the foregoing.

For the man in the street is deeply involved in all this. He is "in the street" only to the political orators. To the rest of us, he is the man in the factory, the man on the truck, and the man behind the orders that industry fills. In short, he makes up this living American industry on whom the politician's charges spatter. As an employee he has a stake in the solvency, the security, and the reputation of the very plants at which criticism may be directed. Knowing the facts, he can answer the critics so far as his own plant is concerned and can see how the same kinds of facts apply to all industry. If he is a customer, suffering inconvenience as a result of the plant's service to national defense, a knowledge of the facts behind the plant's problems will help to make him a defender rather than a critic of responsible business management. If he is a neighbor in the community, the facts will equip him to be an interpreter of industry's problems to the people of the home town.

* * *

In this national defense effort, business enters into a new partnership with government, but, more importantly, into a deeper partnership with the American people. It is more than ever essential that it take all of the American people into its confidence, beginning with the people in its plants and going out through the ranks of its customers and its community neighbors to show them that they have a common interest in seeing that the task of national defense is undertaken in the American way.

As we all know, there are in this country some people who would like nothing better than to see American industry fail in this supreme test of service to the nation. They will watch with jealous eyes every move of every company that is engaged on a defense job. They will disparage its achievements, exaggerate its shortcomings, and distort its motives. For they would like to make over American industry to their own pattern, and they'll never have a better chance to get started with it than has been opened up by the national emergency. Or so it looks to them.

So, great as are the business hazards of the defense program for the individual business man, even greater hazards are involved for American industry as a whole. But, knowing the temper of American industrial leadership as I do, I am confident that it will handle its defense assignment with credit to itself and with great advantage to the nation that it serves—whether in war or in peace.

To help in that supreme test is the opportunity and the privilege of the McGraw-Hill organization.

James H. McGraw Jr.

President, McGraw-Hill Publishing Company, Inc.

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"INCOR'S GREAT FOR

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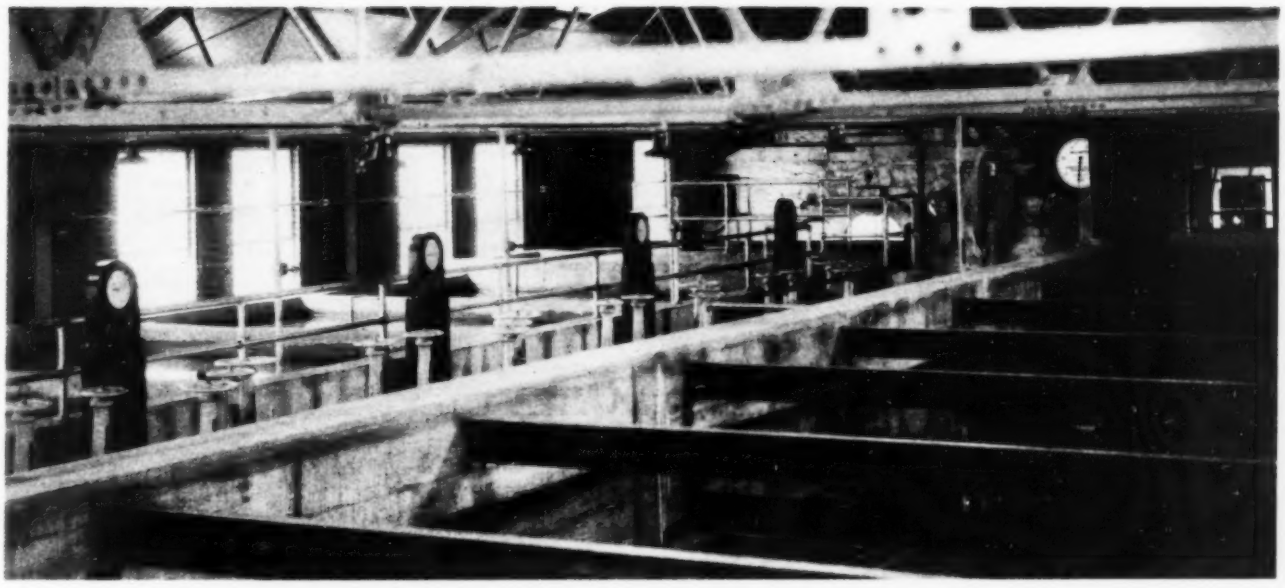

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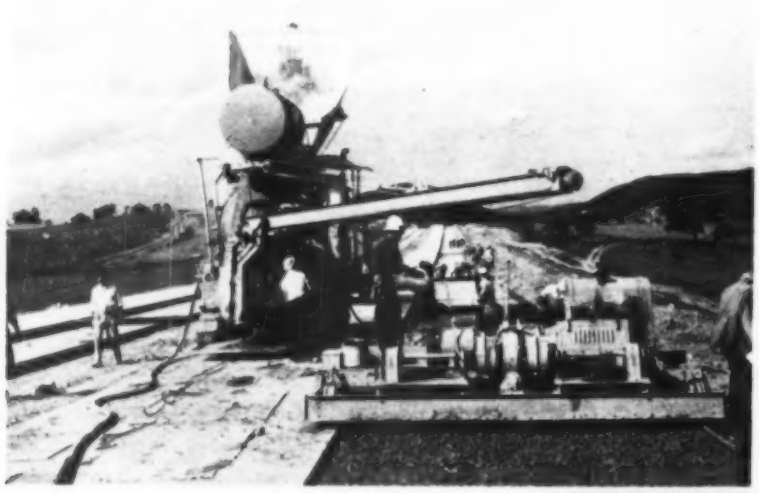

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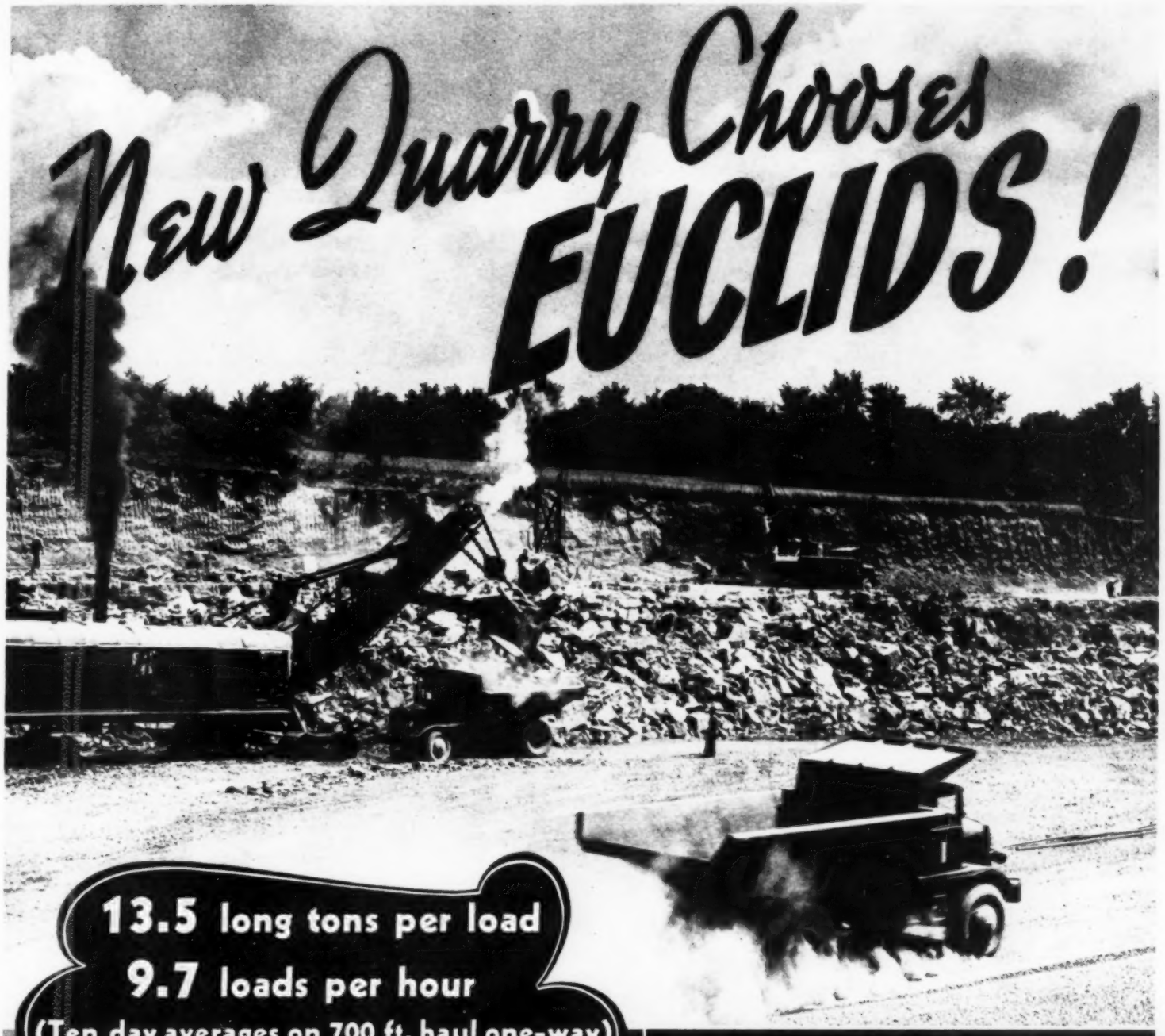

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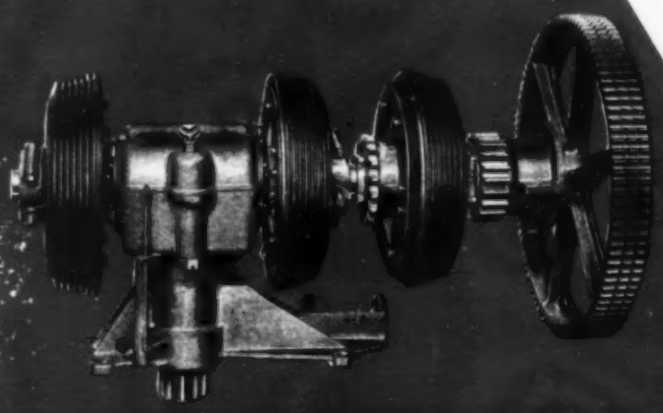

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FIGURES

ESENT DAY EEDS . . .

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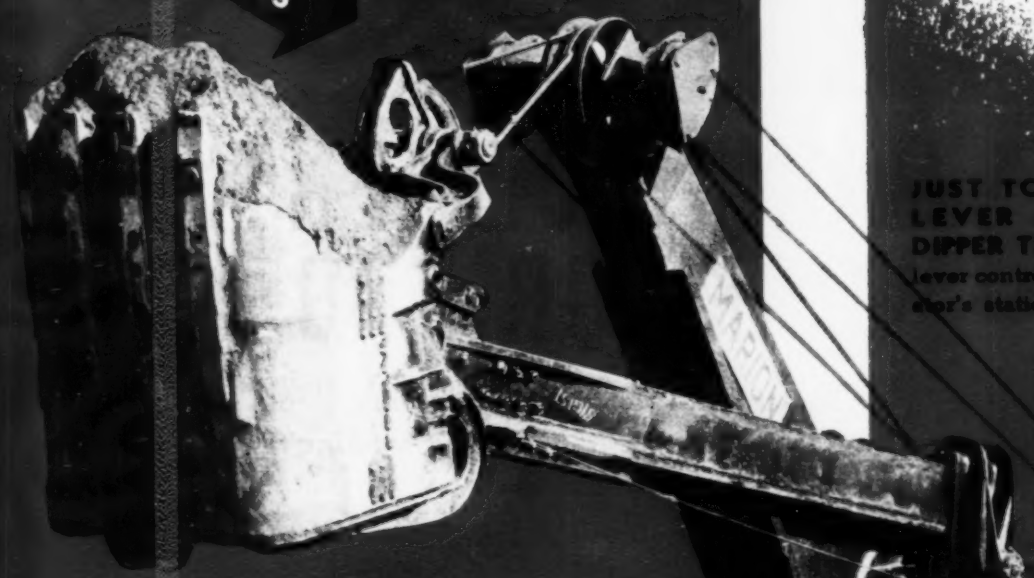
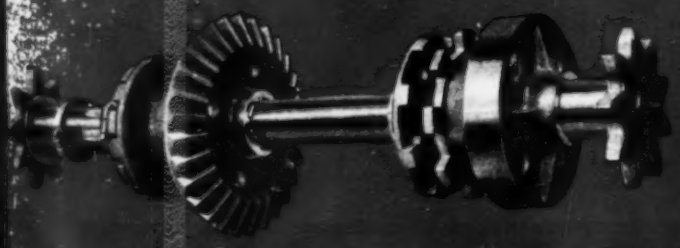
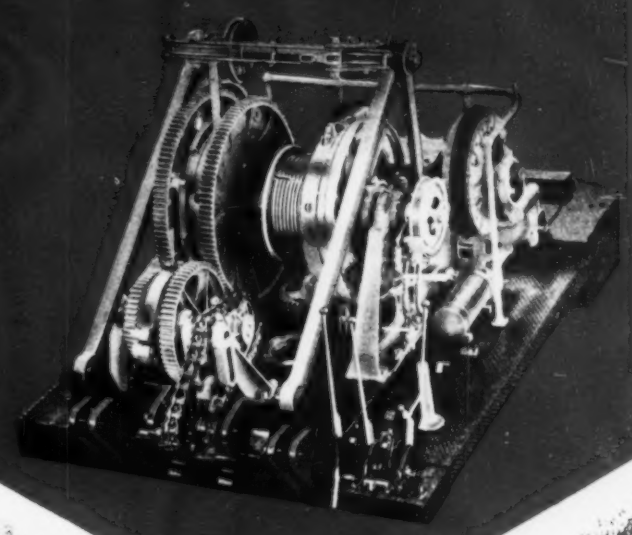


HORIZONTAL PROPELLING SHAFT includes the multiple jaw clutches for controlling the power to the crawler belts and the outside band chock brake that locks the machine against digging thrusts.

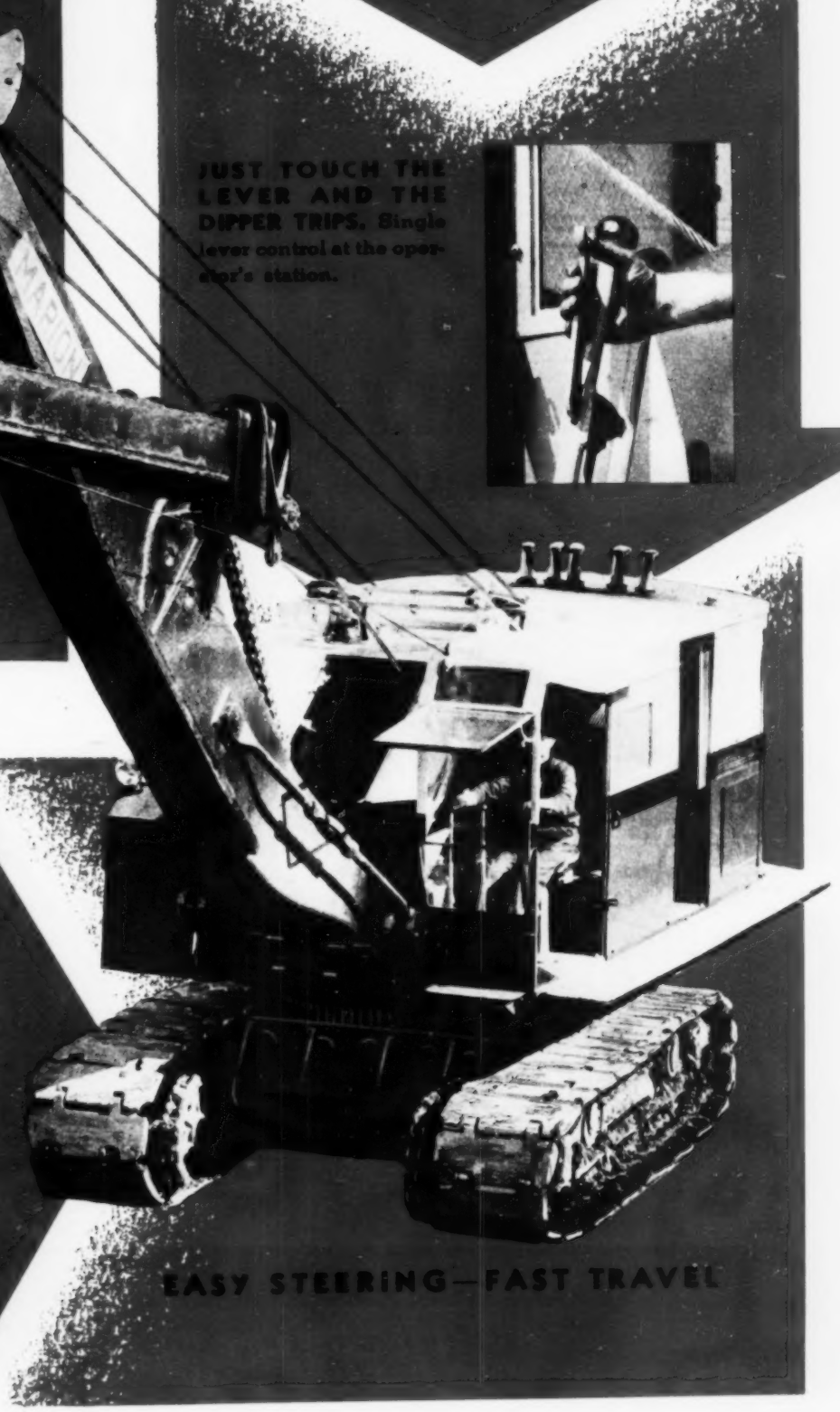


SIMPLE ARRANGEMENT OF GENERAL MACHINERY

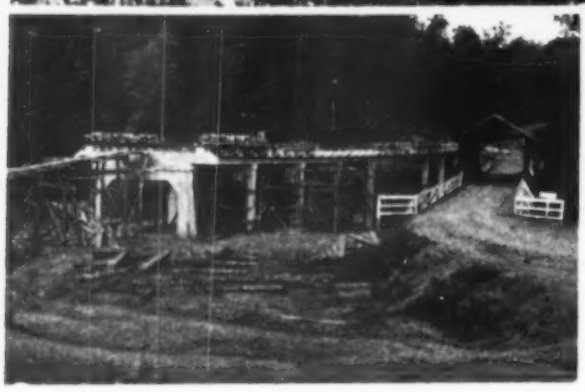
Compactness, plus accessibility, ease of maintenance and operating simplicity.



JUST TOUCH THE LEVER AND THE DIPPER TRIPS. Single lever control at the operator's station.



EASY STEERING—FAST TRAVEL



Bridge over Little River,
Oconee County, S. C.
Owner: South Carolina
State Highway Dept.
Contractor: W. C. Shepherd, Atlanta, Ga.

MAKING CEMENT WORK FOR PROFIT

Sixteen days saved in stripping forms—25% cut in form cost—33% reduction in working time and overhead. Completion ahead of time earned a bonus.

That is what W. C. Shepherd, contractor for this bridge gained in the face of a dubious profit by using Lehigh Early Strength Cement.

Mr. Shepherd knew from previous experience how it would work to his profit. He has used it for most of his grading jobs, where culverts were put into service in seven days instead of twenty-eight—where he moved heavy machinery straight through a job, rather than detouring around culverts, thus saving time and money. This is typical of how Lehigh Early Strength Cement can profitably work for contractors.

In 24 to 48 hours, Lehigh Early Strength Cement equals the strength of normal cement at seven days—produces service strength concrete three to five times faster.

LEHIGH EARLY STRENGTH CEMENT

Use Lehigh Early Strength Cement to cut costs and help profits, as Mr. Shepherd does. Use it when quick completion is imperative or a convenience. Use it to co-ordinate schedules. Use it in winter to save one-half to two-thirds on heat protection costs. Use it for better, denser concrete.

LEHIGH PORTLAND CEMENT COMPANY

Allentown, Pa., Chicago, Ill., Spokane, Wash.

JAEGER, ALONE, Gives You All These Pumping Features

Only $85 f.o.b. Factory—3000 Gallon Bantam Weighs But 52 Lbs.

JAEGER "PRIMING JET" — Up to 5 times faster priming and re-priming — often means difference between profit and loss on job. No adjustments — no need to "gun" engine.

POSITIVE RECIRCULATION CUT-OFF — It's controlled by flow, not pressure.

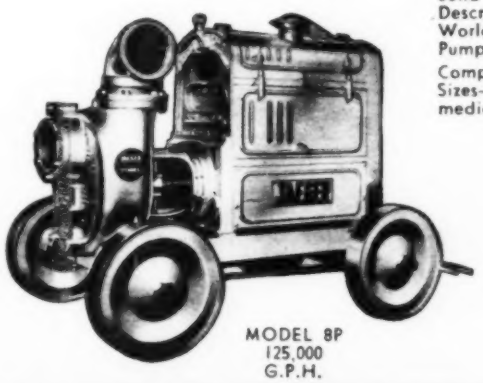
"FULL-RANGE" IMPELLER gives high efficiency under all conditions (built of steel in 4" to 8" sizes).

ACCESSIBLE SEAL — always outlasts the impeller.

PATENTED SELF-CLEANING SHELL — scours while pumping, won't clog, easily accessible.

DEPENDABLE, LONG LIFE CONSTRUCTION — means thousands of EXTRA hours of service.

EVERY PUMP INDIVIDUALLY TESTED for capacity and pressure before it leaves our factory.



MODEL 8P
125,000
G.P.H.

Send for Prices and New Catalog Describing Complete Line of World's Champion Sure Prime Pumps:

Compact 2", 3", 4" and 6" Sizes—Heavy Duty and Intermediate Types.

8" and 10" Sizes, Most Portable Big Pumps on Market — Capacities to 220,000 G.P.H.

Convertible Jetting-Dewatering Pumps (Two Pumps in One).

Vertical Caisson Pumps

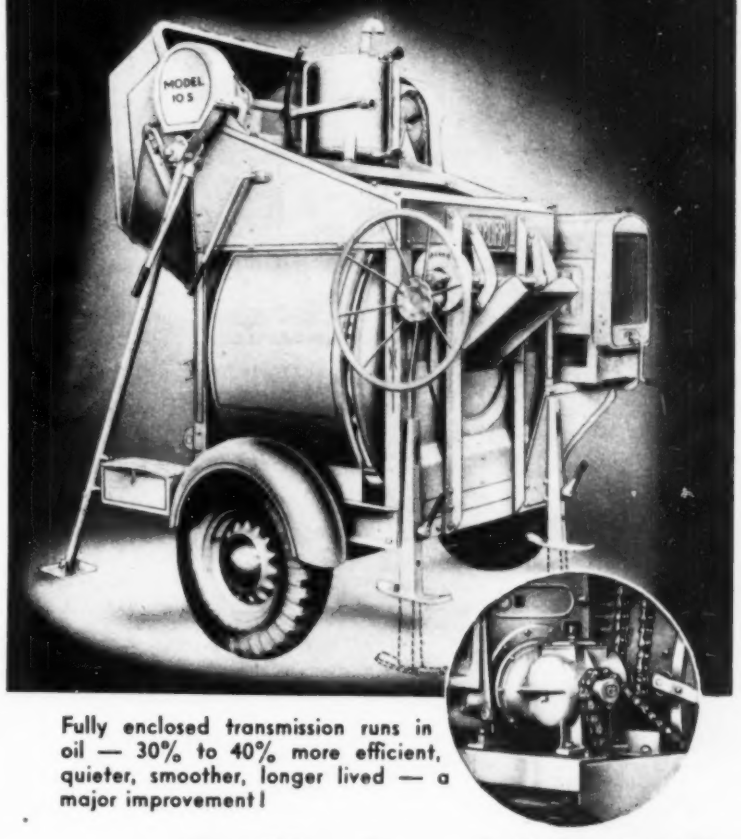
Well Point Systems

Triplex Road Pumps.

THE JAEGER MACHINE COMPANY
800 Dublin Avenue, Columbus, Ohio

MIXERS with AUTOMOTIVE TYPE TRANSMISSION

AND MACHINED STEEL DRUM TRACKS



Fully enclosed transmission runs in oil — 30% to 40% more efficient, quieter, smoother, longer lived — a major improvement!

. . . Built by JAEGER to Mix Faster, Trail and Handle Easier, Last Longer

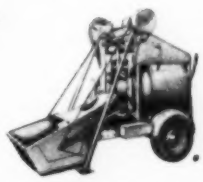
These latest SPEEDLINE Mixers — in 3½S to 56S sizes — have all the features that made Jaeger the world's biggest selling mixers, plus sensational improvements never before offered — AUTOMOTIVE-TYPE TRANSMISSION, 100% BALL BEARING SHAFTS, MACHINED ALLOY STEEL GEARS . . . plus MACHINED, HIGH CARBON STEEL DRUM TRACKS, ON CHILLED, GROUND, CAR-WHEEL ROLLERS . . . plus oversize engines and vital parts.

Here are the huskiest, smoothest running mixers ever built — combining real heavy duty service with easy handling, end discharge trailer design. 2 or 4-wheel mountings interchangeable. Get our new Catalog and prices and compare.

THE JAEGER MACHINE COMPANY
800 Dublin Avenue, Columbus, Ohio

Mixers - Pumps - Hoists - Towers - Truck Mixers - Paving Equipment

3½ S End Discharge with Measuring Batch Hopper



5S Home Builders' Mixer Has All Features of Bigger Mixers

14S Trailer with 90" Wide Skip

2 or 4 Wheels

JAEGER SPEEDLINE

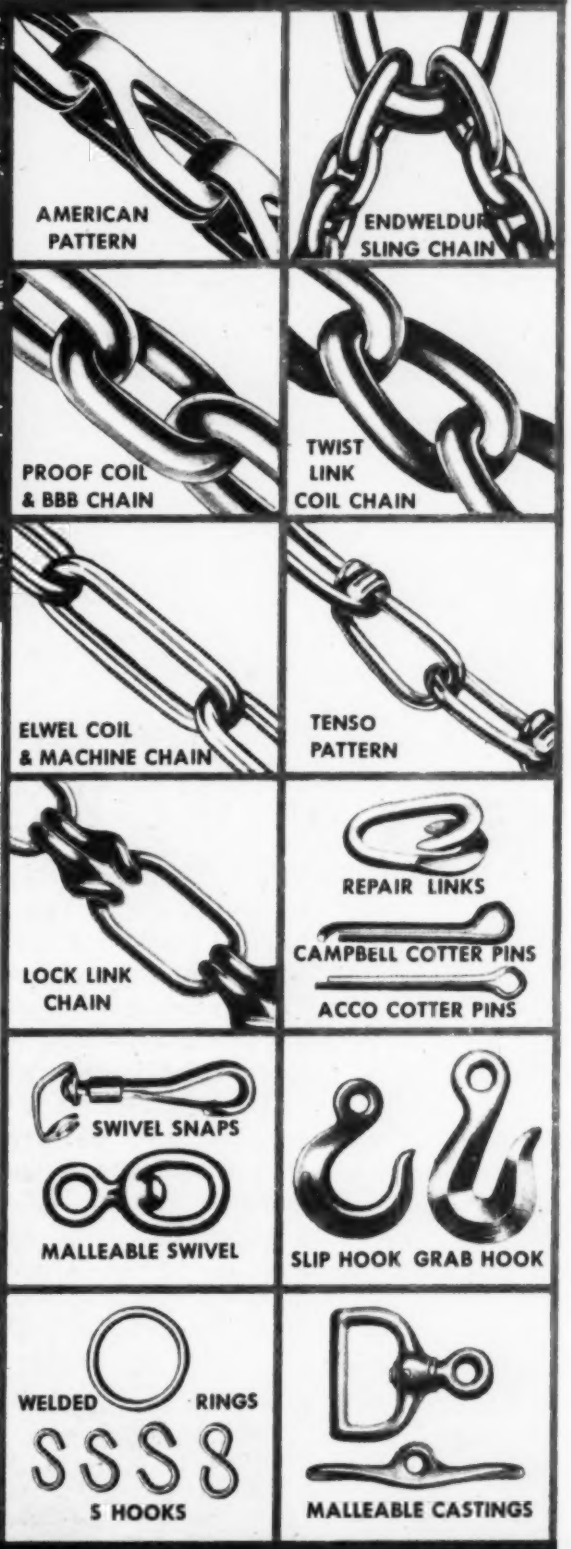
PREPARED!

—to handle any chain job with Safety and Economy

The value of superior chain equipment shows up more and more as American industry speeds up its preparedness activities. Industry wants chain that will handle its loads rapidly and safely—chain that will prevent delays and keep innumerable manufacturing processes running smoothly.

The **American Chain & Cable Company** is prepared to meet that demand—is meeting that demand—with every type of welded and weldless chain that industry uses. With the new Endweldur Sling Chains of toughest alloy steel the company is helping many users set new chain performance records. It is serving others as usefully with wrought iron chain and with the many chain fittings and attachments that are part of its complete line.

complete lines of AMERICAN chains and fittings meet all your requirements



This company, the acknowledged leading chain manufacturing organization of the world, has developed the most complete lines of chains, fittings and attachments from which you can select. In developing these lines the company has always insisted on the highest quality standard—has always taken every means to make its products honest products that will serve the user faithfully. Years of research work in the laboratory and in the field—and the employment of the very best manufacturing practices give a truly substantial guarantee of American Chain quality.

American Chain engineers invite you to tell them of your chain problems. They will be glad to work with you in getting the best service from chain equipment.

Get this FREE Booklet on ENDWELDUR Sling Chain

Write now for this free booklet—which tells you of the important, practical advantages of Endweldur Sling Chain. Address **American Chain & Cable Company, Inc., York, Pennsylvania.**

AMERICAN CHAIN & CABLE COMPANY, Inc.

AMERICAN CHAIN DIVISION
AMERICAN CABLE DIVISION
ANDREW C. CAMPBELL DIVISION
FORD CHAIN BLOCK DIVISION
HAZARD WIRE ROPE DIVISION
MANLEY MANUFACTURING DIVISION
OWEN SILENT SPRING COMPANY, INC.
PAGE STEEL AND WIRE DIVISION
READING-PRATT & CADY DIVISION
READING STEEL CASTING DIVISION
WRIGHT MANUFACTURING DIVISION

In Canada: DOMINION CHAIN COMPANY, LTD.
In England: BRITISH WIRE PRODUCTS, LTD. THE PARSONS CHAIN COMPANY, LTD.

ACCO TRADE MARK

In Business for Your Safety

GRASSO Construction Co., hangs up another record on the BIG Bridgeport Sewerage Plant.

When you inspect a Grasso job you see plenty of action. This experienced contractor has a reputation for making records on job after job. He fitted Bridgeport's 1½ million dollar disposal plant with *one of his six* BAY CITY convertible machines — and is hanging up another record.

On this job the BAY CITY "65" is working with 50′ of boom and 1 yd. clamshell, loading into trucks. Slow work normally — but high production results from well balanced line speed, co-ordinated with a snappy swing that is backed by a dependable machinery assembly and a big power plant to match the heavy-duty design of these sturdy rigs.

The BAY CITY line ranges in capacities to 1½ yards. Take your pick of any of these fast, powerful, easy-to-operate convertible shovels and you will be out front when records are reviewed. It's the 'XTRA PROFIT that counts. Start right — ask for our 32 page illustrated Catalog H-2 — no obligation.

BAY CITY SHOVELS, Inc., Bay City, Michigan

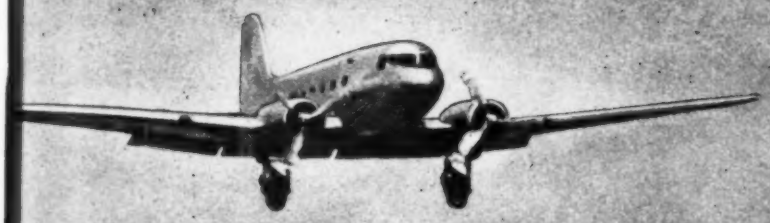
Export Office: 330 West 42nd St., New York City (OPARO)

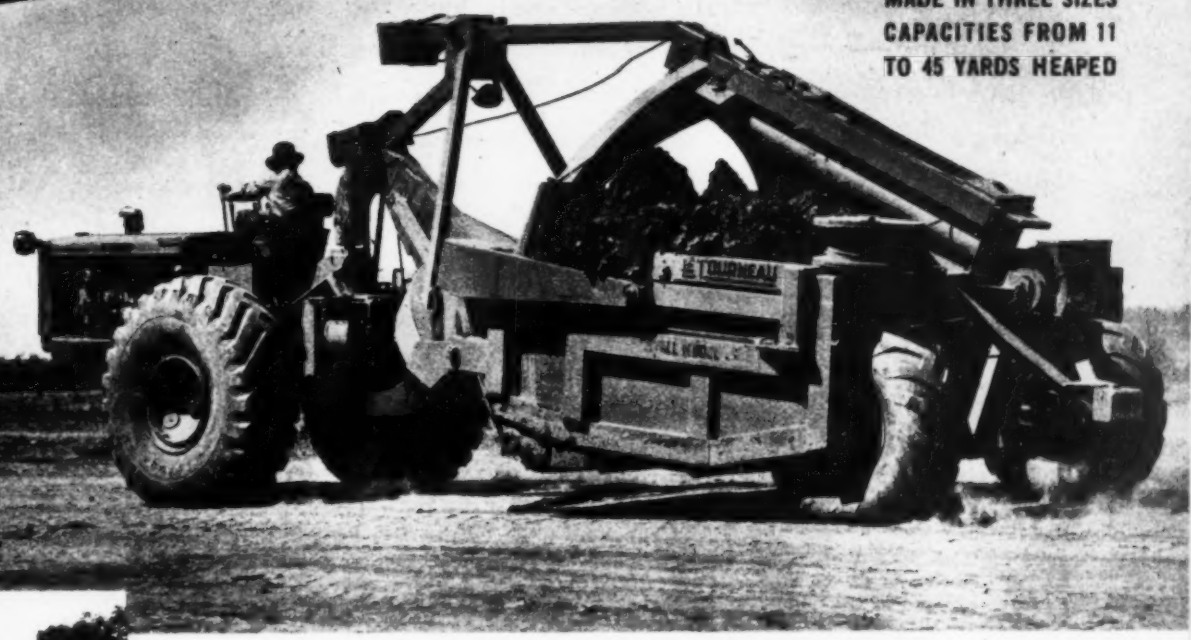
BAY CITY

SHOVELS • CRANES • DRAGLINES • TRENCH-HOES • SKIMMERS

you can MAKE MORE PROFIT on long hauls WITH TOURNAPULLS

This Revolutionary New Earth-moving Unit Gives You Speed of a Truck . . . Pull of a Tractor





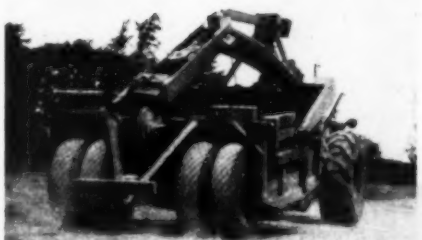
MADE IN THREE SIZES
CAPACITIES FROM 11
TO 45 YARDS HEAPED

One of four C Tournapulls improving Des Moines, Iowa, Airport. These four moved 200 loads of 7 pay yards or better on a 4800-foot round trip haul in 5 hours, 40 minutes.

ALERT CONTRACTORS COUNTRY OVER . . . turn to TOURNAPULLS

One of two C Tournapulls working for D. B. Hill, Wynne, Arkansas. In 10 hours they delivered 193 loads on round trip haul of approximately 8000 feet.

One of two A Tournapulls and Tournatrailers hauling 30 yards per load for Harrison Construction Company at Johnstown, Pennsylvania. These outfits, on a 4300-foot one-way haul, make a complete cycle—load, haul, dump, and return—in 20.8 minutes.



One of five C Tournapulls on A. W. Hodgkiss job at Rapid River, Michigan. On 2.5 mile round trip haul, these outfits averaged 32 trips each 7-hour shift, and maintained a speed of 11.4 m.p.h., including loading and dumping time.

In addition to the above, Tournapulls are now speeding up earthmoving for successful contractors in Oregon, California, New York, Canada, Minnesota, Oklahoma, South Carolina, Tennessee, Colorado, Illinois, Georgia, Florida and Virginia.

Tournapulls take up where tractors leave off—operate with job-proved LeTourneau Carryalls, specially designed for Tournapull operation—travel at speeds that enable you to stretch the profits of scraper operation to long-haul earthmoving.

ELIMINATE COSTLY LOADING EQUIPMENT

Tournapulls get heaping loads quickly with a pusher, haul those loads at truck speeds, spread on the fill in even layers like any LeTourneau Carryall. You save money because there's no need for costly loading or spreading equipment. You save time because there's no waiting in line for a shovel. One fast-moving, self-propelled unit – the Tournapull — loads, hauls, spreads.

EASY TO OPERATE

Operators quickly get the hang of handling Tournapulls. The same positive, quick-acting Power Control Unit that makes Carryall loading and spreading so simple with tractors is used on Tournapulls. Shifting and steering differ but little from tractor operation.

Investigate this new money-making method of moving earth on long hauls. No other method available today moves so much yardage so fast and cheaply. Ask your LeTourneau -" Caterpillar " Dealer about Tournapulls — place your order NOW, make sure of early delivery.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

For Lowest Net Cost per Yard - CARRYALL* SCRAPERS, ANGLEDOZERS*, CRANES, BULLDOZERS, POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, ROOTERS*, TREEDOZERS, TOURNAPULLS*, TOURNATRAILERS*. *Name Reg. U. S. Pat. Off.

Building FOR *Defense*

Engineering News-Record's editors, posted in Washington, on all coasts and in the mid-west, are keeping their readers informed on the gigantic effort of *Building for Defense*. They are in constant contact with Army and Navy heads who welcome them for the help they are giving engineers and contractors in speeding up the construction end of the defense program. Every issue is carrying defense articles and editorials and reporting defense contracts awarded and proposed projects.

But in addition to this regular news about defense construction there is a definite need for consolidating in a single reference issue the basic material so vital to consultants, engineers and contractors.

To conserve their looking-up time and to give them the high spots of what the Army and Navy, private industry, engineers and contractors are doing for national defense, Engineering News-Record will devote its established annual Buildings Issue to defense subjects.

It will be published Oct. 24 and designated *Building for Defense*.

The Washington offices of Rear Admiral Moreell, Commander Thurber, General Moore, General Hartman and Major Allen are cooperating with our editors in every possible way consistent with the public welfare, to make this *Building for Defense Issue* a valuable reference work for engineers and contractors who are handling or are planning to handle defense construction.

This will give you an idea of what will make the October 24 *Building for Defense Issue* a valuable reference book for consultants, engineers and contractors.

- **Engineering and construction organization chart, Army and Navy**
- **Major contracts and contractors**
- **Location map of defense construction activities**
- **Rapid mass construction of training camps**
- **Permanent Army and Navy quarters**
- **Features of new airfields and bases**
- **Airfield construction in the Arctic**
- **Production plants for tanks**
- **Powder plant buildings**
- **Igloo magazines**
- **Shipbuilding drydock**
- **Miscellaneous structures such as engine-test buildings, water-insulated roofs of plane repair shops, wind tunnels, hospitals, portable buildings, heating plants, mirror plants**
- **Developing roads for defense**
- **Industrial housing requirements**
- **Private manufacturing plants**

Of Special Significance To Advertisers

Of special significance to advertisers is the provision for extra point-of-sale distribution in the defense construction market.

Aside from an outstanding editorial job, the *Building for Defense Issue* offers advertisers a sure-fire merchandising plan with upwards of 6000 bonus circulation.

The entire *Building for Defense* section, which will be printed on coated stock, will be open for advertisements in units of full pages. This section will be reprinted as a booklet and mailed to 6000 or more contractors, engineers and architects as they receive defense contracts.

Every item of equipment, materials and supplies advertised in this booklet section will be indexed by product classification, thus adding to the reference value of both the issue and the reprinted booklet.

The plan gives each advertiser the 32,225 regular paid circulation of Engineering News-Record, plus thousands of extra point-of-sale circulation to contractors with fresh contracts in their pockets.

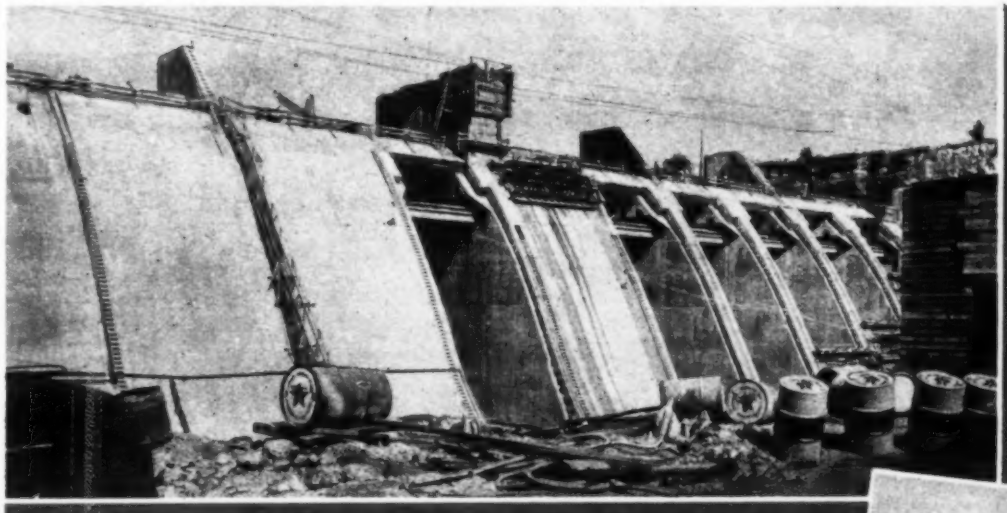
For further details regarding this unique merchandising opportunity ask us to have a News-Record representative call.

OCT. 24 *Engineering News-Record* **OCT. 24**

330 WEST 42nd STREET, NEW YORK, N. Y.

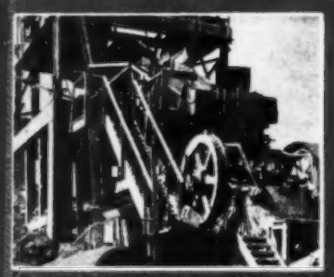
Contractors Report

OUTSTANDING RESULTS

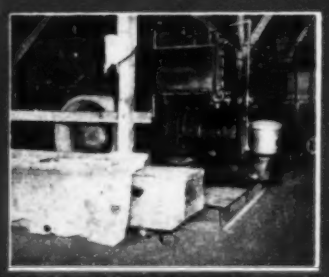


. . . at Possum-Kingdom Dam Project

THE POSSUM-KINGDOM DAM on the Brazos River near Mineral Wells, Texas. Construction by C. F. Lytle and Al. Johnson, and R. W. Briggs & Co. . . . lubricated by Texaco.



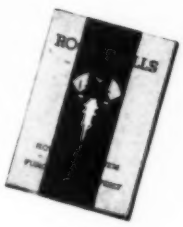
BRIGGS' Allis-Chalmers 40" x 42" Jaw Crusher handled 325,000 yds. of aggregate in 14 months, without a bearing adjustment. *Texaco Marfak* used.



THESE TWO Sullivan Balanced Angle Air Compressors are subjected to heavy loading, yet are always up to maximum efficiency. *Texaco Algol Oil* is given full credit for its part in this performance.

SHOVELS AND TRUCKS operated by R. W. Briggs & Co. are always at peak, lubricated with Texaco Marfak, Thuban, Crater.

TEXACO'S INTERESTING BOOKLET on Rock Drills, their care and lubrication, 36 pages of valuable information. Full of illustrations. It's yours for the asking.



Texaco Dealers invite you to tune in The Texaco Star Theatre — starring Kenny Baker and Frances Langford — Every Wednesday Night—ColumbiaNetwork. 9:00 E.D.T., 8:00 E.S.T., 8:00 C.D.T., 7:00 C.S.T., 6:00 M.S.T., 5:00 P.S.T.

RUSHING completion of the Possum-Kingdom Dam Project, Mineral Wells, Texas, the C. F. Lytle and Al. Johnson Construction Co., and R. W. Briggs & Co. have enjoyed long, continuous service from their equipment.

Both of these contracting firms freely give credit to the lubricants used . . . TEXACO.

In 14 months, a big jaw crusher has handled 325,000 cu. yds. of concrete aggregate without need of a bearing adjustment. It is lubricated with *Texaco Marfak.*

On shovels, draglines and "Cats" they have had similar success . . . using *Texaco Ursa, Marfak, Thuban,* and *Crater.*

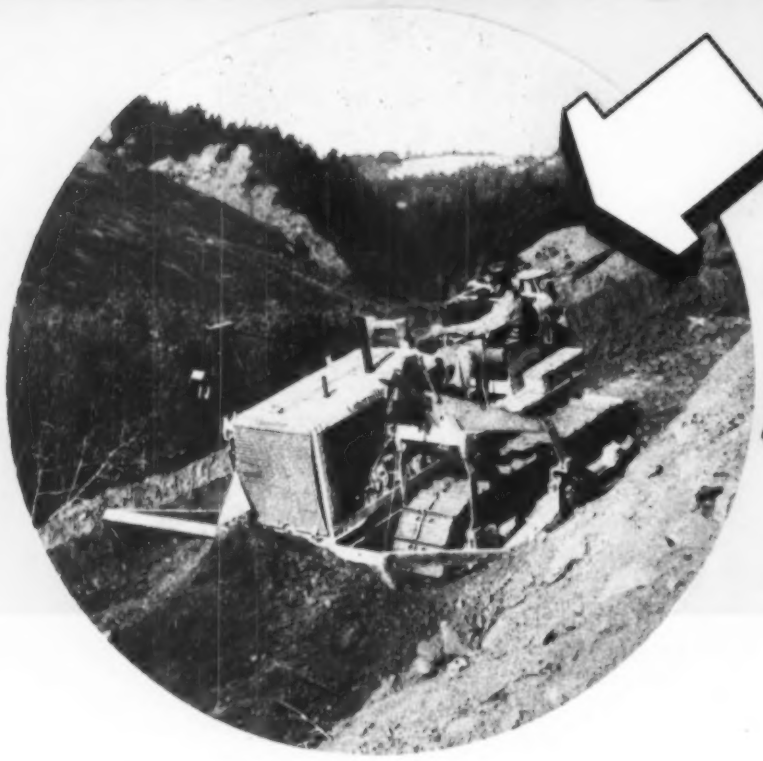
In 3 big air compressors operated by Lytle & Johnson Construction Co., *Texaco Algol Oil* keeps valves active and ports clean, resisting gumming and hard carbon formation. What little carbon forms is soft, fluffy, harmless.

Trained lubrication engineers will gladly cooperate in making savings with Texaco Lubricants in your equipment. Just phone the nearest of more than 2300 Texaco warehousing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

TEXACO ALCAID, ALGOL, AND URSA OILS

Melting Molding



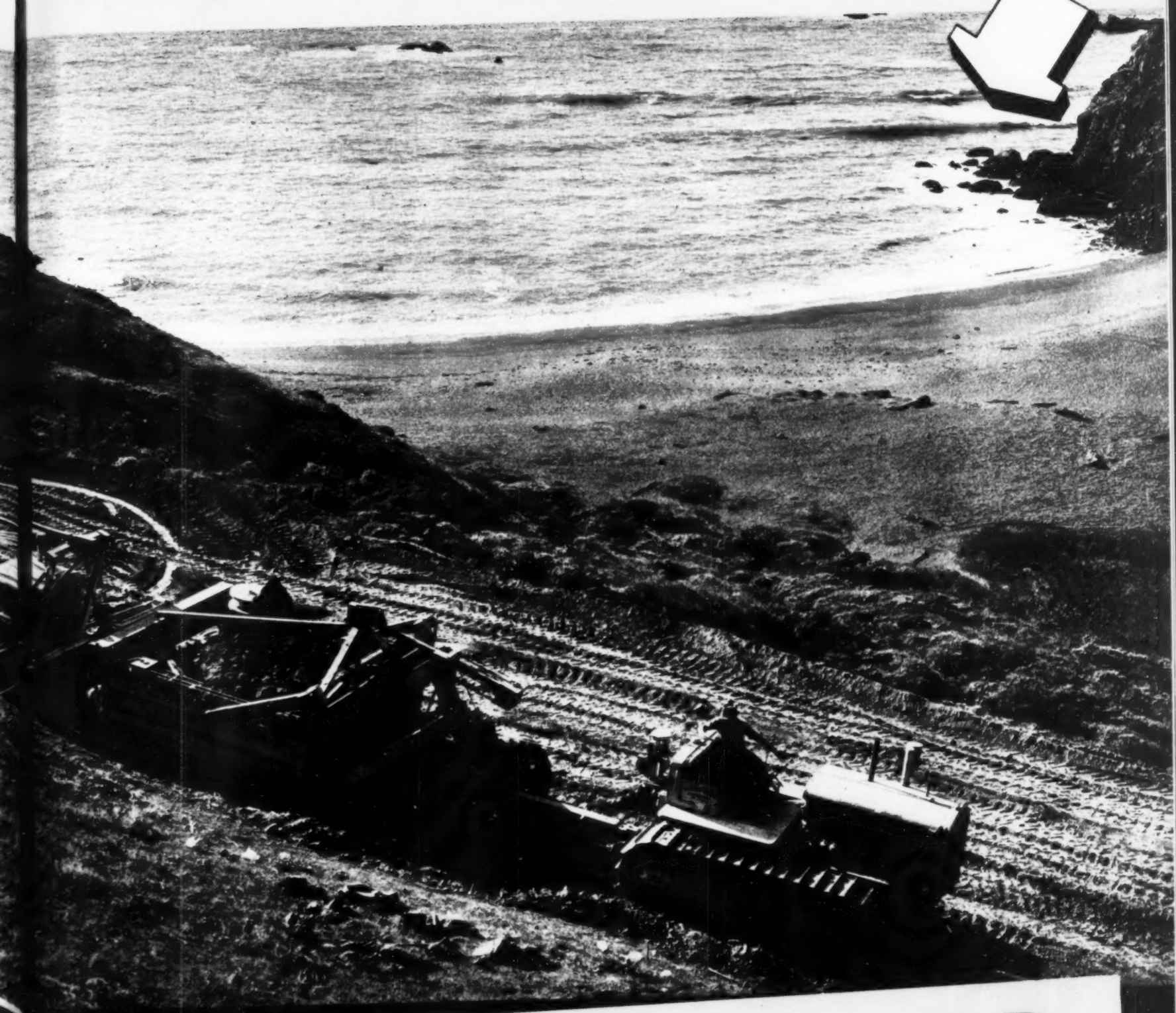
LANDSCAPES change rapidly — and profits come fast—when rugged, dependable, sure-gripping "Caterpillar" Diesel Tractors apply their powerful push or pull to big-yardage rippers, bulldozers, scrapers and wagons.

On a realignment project on State Highway No. 1, between Jenner and Stewarts Point, California, Guerin Bros., contractors, undertook the excavating and moving of several hundred thousand yards of earth under difficult operating conditions. There were some deep cuts and sizable fills. A number of bridges had to be moved. Before a fleet of "Caterpillar" Diesel Tractors, teamed with LeTourneau Rooter, bulldozers and Carryall scrapers, humps "melted" away, dips were filled, bridge approaches built, subgrades formed. . . . And nearly a month before the scheduled completion date, the job was done! Though the punishment they took was severe, the "Caterpillar" Diesels stood up in characteristic "Caterpillar" fashion. Operating cost, through their low maintenance and efficient use of low-cost fuel, was low. . . . Everything about them supported the reputation "Caterpillar" Diesels have gained to become the most widely used track-type tractors in the world.

• Look over any "Caterpillar" Diesel-powered job. Watch the yardage roll onto the fill behind "Caterpillar" Diesel Tractors. See how easily "Caterpillar" Diesel Motor Graders handle a variety of jobs that once required hand work or special equipment. Check with the superintendent and hear how "Caterpillar" Diesel Engines bring the same high-grade performance to stationary jobs. Consider the complete and readily available service and replacement-parts facilities behind "Caterpillar" equipment. Then see your "Caterpillar" dealer, and let him show you how you can step up work-volume, cut overhead and operating costs by STANDARDIZING ON "CATERPILLAR" DIESEL POWER.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

down MOUNTAINS
out HIGHWAYS

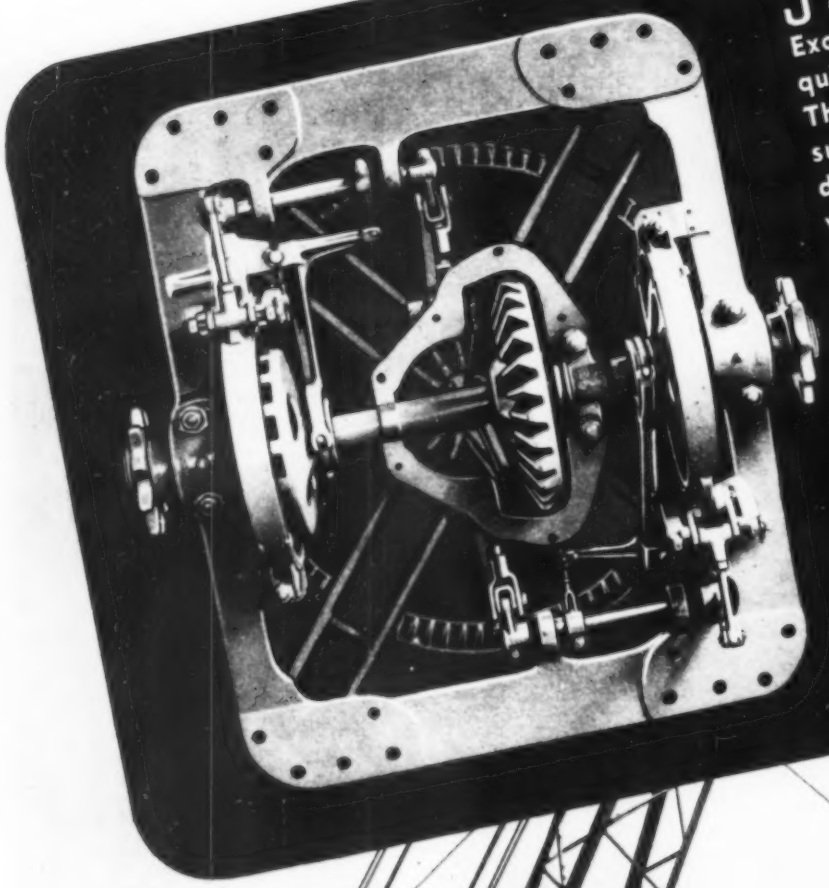


CATERPILLAR

REG. U.S. PAT. OFF.

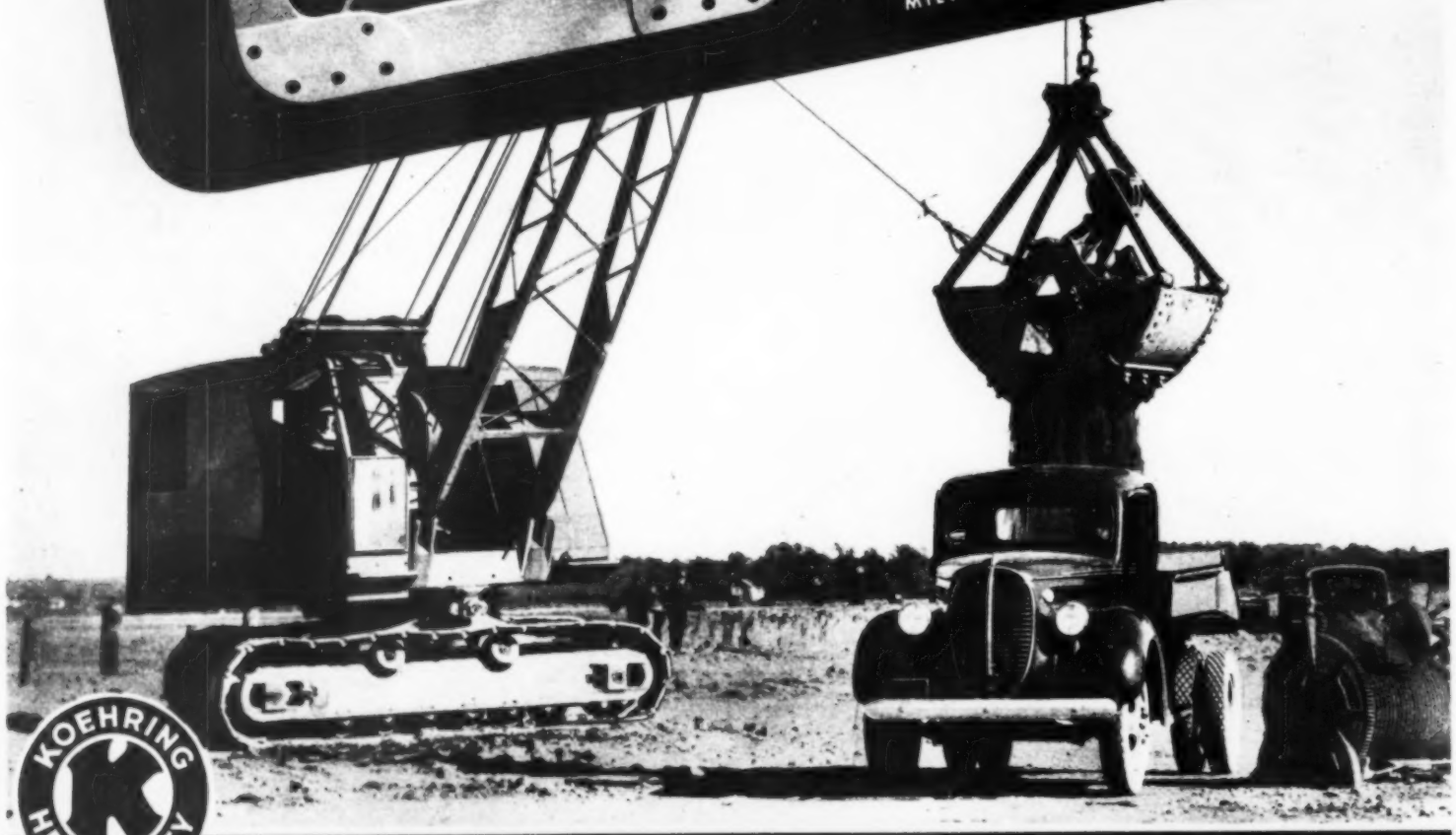
TRACK-TYPE TRACTORS • ROAD MACHINERY • DIESEL ENGINES AND ELECTRIC SETS

TWO GEARS IN LOWER TRACTION



STEERING and traction control is easy and positive on Koehring Excavators. Only two gears are required for the lower traction drive. This simplicity of construction assures a low maintenance cost. A dirt-tight case houses these gears, which run in oil. Two multiple jaw clutches, operating independently connect the driving shaft with the crawlers. Either crawler can be partially or wholly locked for steering. Both can be locked against traction movement. All movements are easily controlled by the operator. Koehring Excavators can be quickly moved and positively controlled . . . cutting lost time and providing stable operation.

KOEHRING COMPANY
MILWAUKEE . WISCONSIN



KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

"Am I getting the lowest possible per-unit-of-use cost from my wire rope?"

If you have not already tried Wickwire Rope, do so. The longer life of Wickwire Rope, far beyond that of rope built only to standard specifications, is showing rope users everywhere new "lows" in rope costs. If you are already using a Wickwire Rope, you are entitled to and should take advantage of Wickwire Spencer Engineering Service. Request a representative to verify the particular kind and lay of rope as best suited for your job. Send for a free copy of "Know Your Ropes" and put into practice its many money-saving hints in the care of rope in use.

Questioning yourself about rope costs may result in their material reduction. A Wickwire representative will gladly help you.

WICKWIRE SPENCER STEEL COMPANY

General Offices: 500 Fifth Avenue, New York City; Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Seattle. Export Sales Department: New York City

C.E. Oneal
ELLENSBURG, WASHINGTON
HIGHBALLS his Columbia Canyon Job
with a fast, dependable LIMA Shovel

Columbia Canyon in North Central Washington, is the site of one of the year's most interesting road jobs. Here, C. E. Oneal, with modern equipment and streamlined methods, "highballed" 859,220 yards of excavating to completion in six months, or an average of 143,200 cubic yards per month. In the rock cuts and heavy clay, a LIMA shovel kept the job ahead of schedule, working two 8 hour shifts daily most of the time, proving its ability to move big yardage quickly and economically. When you have a job where speed is the keynote, don't take chances with old, obsolete equipment—be sure with LIMA, the excavator that is designed and built to stand the test under pressure.

LIMA LOCOMOTIVE WORKS, Incorporated
Shovel and Crane Division - - - LIMA, OHIO
NEWARK, N.J. NEW YORK, N.Y. DALLAS, TEXAS CHICAGO, ILL.
MEMPHIS, TENN. LOS ANGELES, CALIF. SAN FRANCISCO, CALIF.
PHILADELPHIA, PA. SEATTLE, WASH. SPOKANE, WASH.
PORTLAND, ORE. MONTREAL, Quebec, Can. VANCOUVER, B.C.

Write for bulletins

...ion was completed in this sec...
...ng October and November.

Due credit must be given the 17/8-yd. Lima for its power, stamina and speed. To my knowledge this shovel has been down only once for repairs throughout a period of six months of continuous operation, and those repairs were only minor. During this time, it has worked two 8-hour shifts each day and most of its time has been spent in rock.

Looking Ahead

We are not through... but everyone concern... easier, jaws d... miles,...

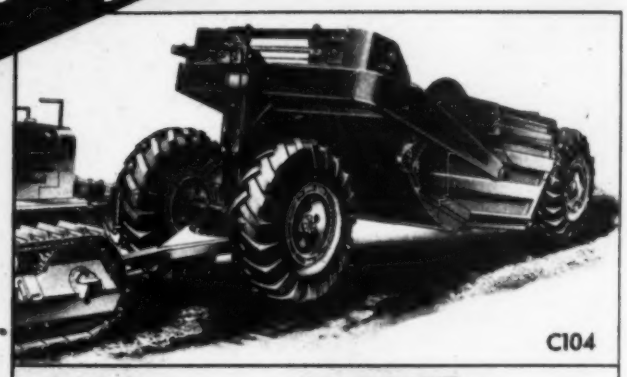
Excerpt from May, 1940 Issue Pacific Builder and Engineer

LIMA

LIMAS ARE BUILT IN 3/4 YARD CAPACITY and LARGER

La Plant-Choate CARRIMOR Scrapers

7 Big Money-Saving Models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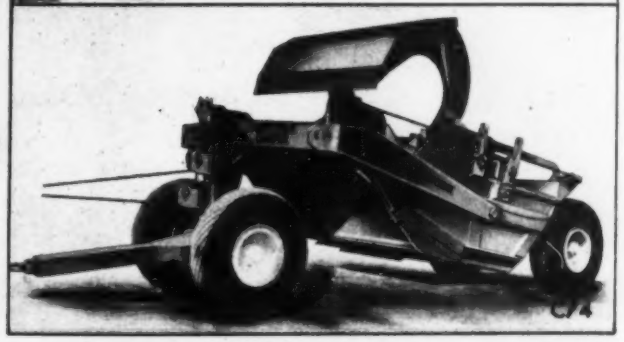


4 Models Forced Ejection Type Scrapers

C86

Select the Size and Type CARRIMOR to Do Your Jobs Most Economically

3 Rear Dumping Models

C71—Carrying Position

C71—Dumping Position

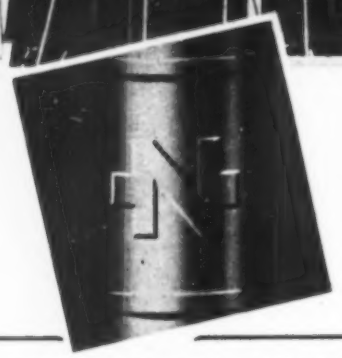
Successful operators cash-in on every opportunity to trim production costs. And the size and type of equipment you use often determines whether you gain these opportunities to save time and money. Recognizing the tremendous importance of this fact, LaPlant-Choate offers shrewd contractors a complete line of famous Carrimor Scrapers in 7 different sizes — thus assuring an economical Carrimor for every job!

The 4 big Forced Ejection Type Scrapers give you a choice of 12, 16.5, 19 and 33 cu. yd. capacities. In the 3 fast, versatile Rear Dumping Carrimors, you can select units of 4, 6, and 8 cu. yd. capacities. And every one of these models has the rugged strength and easy loading qualities to handle heaped measure loads *consistently* . . . day after day. You can *depend* on them to *move more yards* in *fewer trips* at *lower cost!*

Every LaPlant-Choate Carrimor has exclusive features and advantages that are vital to better performance, longer service and extra profits. Let your LaPlant-Choate and "Caterpillar" dealer show you how LaPlant-Choate experience and engineering leadership give you the best in quality and features as well as a better performance in the field. Compare — and you'll modernize with LaPlant-Choate Carrimor Scrapers.

LA PLANT-CHOATE MANUFACTURING CO. Inc.
CEDAR RAPIDS, IOWA.

KEEP AHEAD OF SCHEDULE



Order bars that bear the symbol of the Concrete Reinforcing Steel Institute. This symbol assures you top quality bars, of domestic manufacture, rolled from new billet steel.

—with bars you can get *On time!*

CONSTRUCTION schedules are easier to meet when you specify U·S·S Concrete Reinforcing Bars. Because, wherever your job, you won't be far from a fully stocked U·S·S distributor. Should you desire cutting or bending, he can do it to your specifications. He delivers the bars you want *when* you want them. You run no risk of loss from idle labor or equipment.

U·S·S Concrete Reinforcing Bars carry double proof of value. First, they are a U·S·S product—a name that stands for high quality in steel everywhere. Second, every bar bears the Quality Symbol of the Concrete Reinforcing Steel Institute. This is your guarantee that it is full size, cleanly rolled from *new* billet steel to standard specifications, and of domestic manufacture.

It is worth money to have a dependable source of supply. For quality and prompt delivery on your next job specify U·S·S.

U·S·S CONCRETE REINFORCING BARS

Manufactured by

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Export Company, New York

UNITED STATES STEEL

T is FREE Catalog
shows how

EXPERIENCED USERS SAVE MONEY

with **HEIL**
EARTH MOVING EQUIPMENT

Send for your copy today

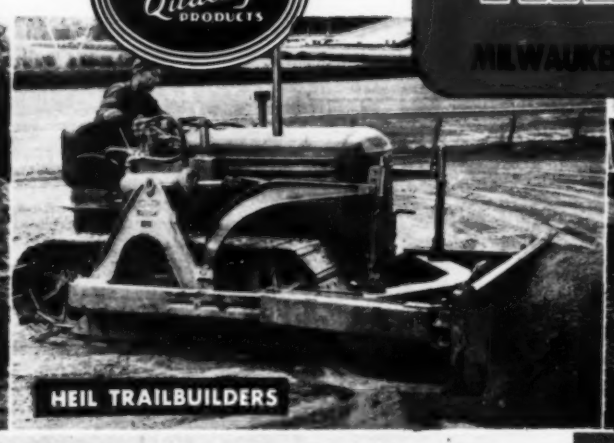
Here's an illustrated catalog which shows how experienced contractors all over the country are moving more yards per day — at less cost — with dependable Heil dirt-moving equipment . . . Profit by the experience of seasoned road-builders who have proved to their own satisfaction that efficient Heil equipment insures enviable yardage records on every job — even under the most adverse conditions.

If you're interested in bidding low and making money on the tough jobs, it will pay you to write today for Heil Bulletin No. RM 525 . . . Use the handy coupon below.

HEIL Quality PRODUCTS

THE HEIL CO.
MILWAUKEE, WISCONSIN • HILLSIDE, NEW JERSEY

HEIL BULLDOZERS


HEIL TRAILBUILDERS

HEIL CABLE SCOOPS

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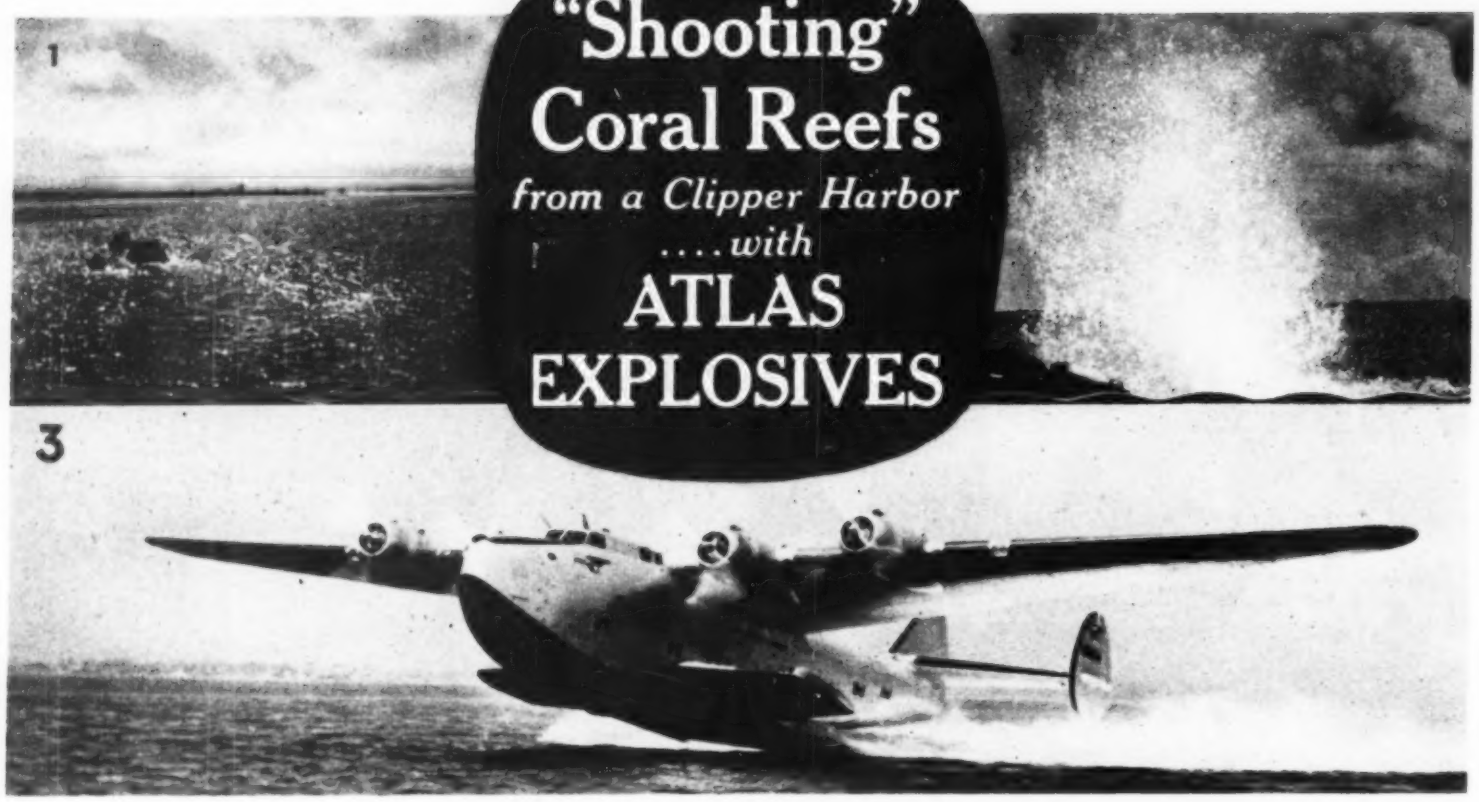
O K, HEIL:
I'm interested in how Heil Earth Moving Equipment will cut my operating costs. Send your free bulletin No. RM 525.

Name .....

Address .....

City ..... State .....

"Shooting" Coral Reefs *from a Clipper Harbor ....with* ATLAS EXPLOSIVES



1 View of harbor, showing (at left) a jutting tip of treacherous coral.

2 A burst of flying spray as Atlas Explosives and Blasting Supplies go into action.

3 A Clipper coming to rest after a long Pacific flight. (Photo courtesy Pan American Airways, Inc.)

CANTON ISLAND, a Clipper resting-place on Pan American's new service to New Zealand, supplies the scene for another Atlas performance for "Safety First."

Atlas Explosives, Atlas Blasting Supplies and Atlas Technical Service are daily working on jobs that demand that special "know how." Perhaps you have such a problem yourself. Whatever its nature, the Atlas Representative will be glad to help!

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

Allentown, Pa.	Denver, Colo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
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Butte, Mont.	Joplin, Mo.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Chicago, Ill.	Knoxville, Tenn.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
	Los Angeles, Calif.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

DIFFERENTIAL STEERING!

—Power at all times on both crawlers is a NORTHWEST Advantage

NORTHWEST Differential Steering (on Northwests of 1 yard capacity and larger) gives you positive traction at *all times*—full power on both crawlers even when turning. Differential Steering brings you greater power and mobility when you need it most—in the tough spots it gets you where you want to go easier, quicker and with less delay.

What's your choice? *Mobility that negotiates all ground conditions* or mobility that limps around corners with only *one live crawler*—miring down in soft going and binding with destructive friction as it slides around, setting up strains that must eventually show themselves in repair bills and delay?

You need Northwest mobility—and once you have it you'll wonder how you got along without it. Why not let us tell you more about it?

—Buy the crawlers that can handle the tough going and you can forget about the easy going!

NORTHWEST ENGINEERING COMPANY
1728 Steger Building
28 East Jackson Boulevard
Chicago, Illinois

MICHIGAN
NEW YORK WORLD'S FAIR
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LA GUARDIA FIELD
(NORTH BEACH AIRPORT)
LANGLEY FIELD
NORFOLK NAVAL BASE
AIRPORTS IN ENGLAND
(LOCATIONS CENSORED)
CHAIN O'ROCKS BRIDGE
(ACROSS THE MISSISSIPPI)
U. S. LEVEE & REVETMENT
WORK NEAR NEW ORLEANS
OLD SPANISH TRAIL
LINCOLN MEMORIAL DRIVE
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ARLINGTON CEMETERY
SKYLINE DRIVE
VIRGINIA
YOSEMITE PARK
SHERIDAN ROAD

The Barber-Greene
TAMPING-LEVELING
FINISHER
was used on these
FAMOUS JOBS

For quality, permanence and economy, they choose the Barber-Greene. Send a card for the B-G Finisher Booklet. 40-9

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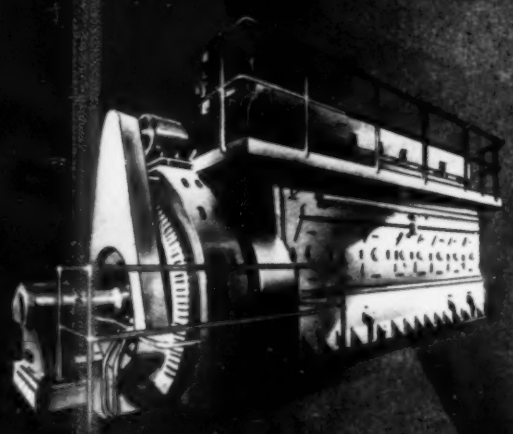
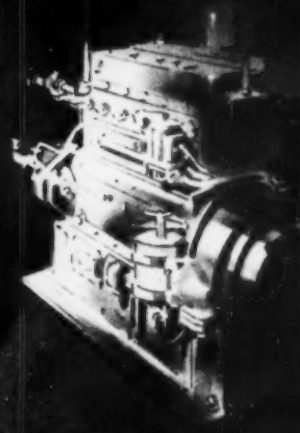
AURORA ILLINOIS
STANDARDIZED MATERIAL HANDLING MACHINES

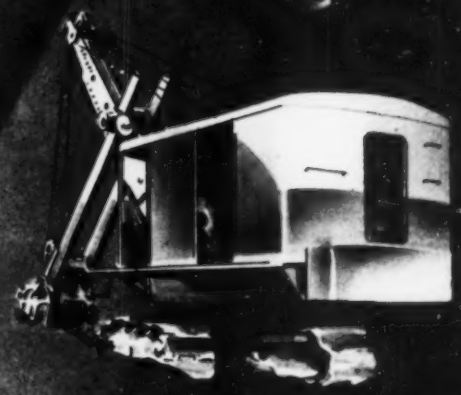
DISTINGUISHED SERVICE

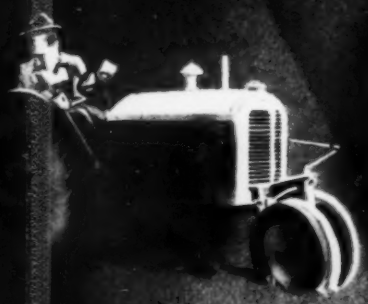
on all types of Diesel engines

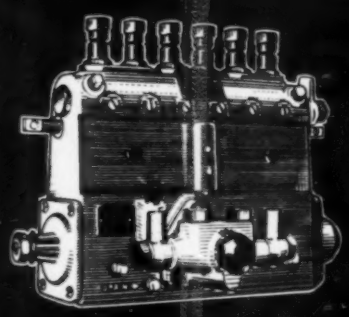
In almost every industry one manufacturer stands supreme . . . in a class by himself. In the field of fuel injection equipment, the experienced user recognizes American Bosch leadership. He knows that the name American Bosch is his guarantee of dependable quality and supply, whatever the size and type of engine, whatever the service requirement. American Bosch Corporation, Springfield, Massachusetts.











AMERICAN BOSCH

Fuel Injection STANDARD OF AMERICA WORLD WIDE SERVICE *Equipment*

BUILDING THIS SLUICEWAY was no cinch

. . . YET SEE HOW ARMCO MULTI PLATE SIMPLIFIED THE JOB

Ease of handling made it simple to erect this Multi Plate structure above water and on a relatively common trestle. No heavy, expensive equipment or skilled labor was needed.

THE PROBLEM: To construct a sluiceway as the first step in replacing a wooden bridge with a permanent earth causeway from island to mainland. This to serve as an equalizer between lake and lagoon waters at the site of the 1933 World's Fair. Installation of the 327 foot structure was complicated by the necessity for erecting and placing in 30 feet of water. Ease of handling was important.

THE SOLUTION: Experienced engineers decided on ARMCO Multi Plate Pipe as the safe, practical answer to the problem. Their choice was greatly influenced by the economy and ease with which the sturdy plates could be erected as well as the structural safety factor of the flexible, corrugated design. Here's how they did it:

The easily-handled ARMCO Multi Plate sections were assembled above water on a special trestle composed of double pile bents on 18-foot centers. Then the completed structure was lowered onto a prepared bed by means of 18-foot screws attached to the top of the plates. The pipe was then covered with 28 feet of hydraulic fill.

While this installation is unusual, ARMCO Multi Plate brings similar benefits under ordinary conditions. Use Multi Plate Pipe or Arches to speed the work and provide safe strength for stream enclosures, bridges, large sewers or special drainage structures. You'll save time and money. Write us for complete information. ARMCO DRAINAGE PRODUCTS ASSOCIATION, 5048 Curtis St., Middletown, O.

The Multi Plate was lowered to a prepared bed by 18-foot screws attached at intervals to the top plates of the structure. Note the old bridge and the trestle supporting the pipe.

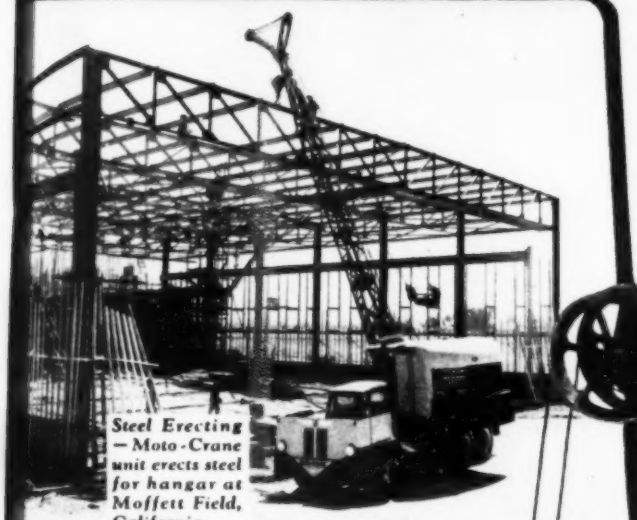
ARMCO MULTI PLATE

A TYPE OF PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

From COAST THEW CENTER DRIVE To COAST

Crash Plane Service—Lorain crane hustles damaged plane from field at Cleveland Air Races.

Drainage—Two ¾-yd. Lorain-40A clamshells dig trenches and lay pipe at new Washington, D. C. airport.



Steel Erecting—Moto-Crane unit erects steel for hangar at Moffett Field, California.

LORAINS

ARE BUSY BUILDING and SERVING AIRPORTS

Lorain shovels and cranes are valued members of many a "ground crew" at the nation's leading airports. Large numbers are engaged in constructing new fields and hangars to bolster our transport and defense facilities. Others are used to speed general maintenance work and ship repairs.

This selection of Lorains for such a wide variety of airport operations hinges on two important factors. One, whether you need a heavy-duty, big-capacity shovel or crane, or a mechanized rubber-tired unit that can skip from job to job at 20 to 30 miles per hour—you'll find it in the complete ⅜ to 2½-yd. Lorain line. Two, you get top-notch performance, regardless of the type or capacity selected, because all Lorains are built to Center Drive design for direct-to-the-point power application, increased capacities per pound of weight and a stronger, more simplified construction.

Complete information on Lorains, including down-to-earth performance data, is available on request.

THE THEW SHOVEL CO.
LORAIN, OHIO

Ship Repairs—Lorain crane handles motor replacement job at California airport.

Steel Erecting—Lorain-95 crane sets steel for hangars at La Guardia Field, New York City.

Grading—1⅝-yd. Lorain-79 handles 2,500,000 yds. of excavation for Snohomish County, Wash. airport.

LORAINS ⅜ TO 2½ YD.

How thorough lubrication lengthens the service life of wire rope

This is No. 5 in a series of informative articles for Wire Rope users prepared by the Macwhyte Wire Rope Company.

The importance of thorough Wire Rope lubrication in obtaining safe and economical service cannot be overestimated.

Wire Rope is a complicated piece of machinery. A 6 x 19 rope, for instance, is made up of 114 wires plus a core (which may be hemp, or an independent wire rope center).

As the rope bends over sheaves and drums the wires continually move and rub against each other. Each wire becomes a bearing surface that grinds and wears against other wires—unless all are properly lubricated.

Proper lubrication is just as important to wires in your rope as it is to gears in your car.

Two Lubricating Methods

1. Internal Lubrication. A most effective internal lubrication has been pioneered by Macwhyte. During the rope's manufacture each wire is thoroughly covered, spaces between wires completely filled, with a special lubricant. This compound does not dry or flake off in extreme cold. It does not melt or run under summer heat.* This special lubricant protects against internal friction and corrosion.

2. External lubrication, applied on the job, acts to seal in the internal lubrication. It also guards external wires against corrosion and reduces abrasion.

CONCLUSION: If a wire rope user wants the greatest possible service from wire rope, it is wise to buy a rope which is internally lubricated during manufacture (not all ropes are). No external applications applied later can possibly reach the inside wires where it is needed most.

Engineering Service

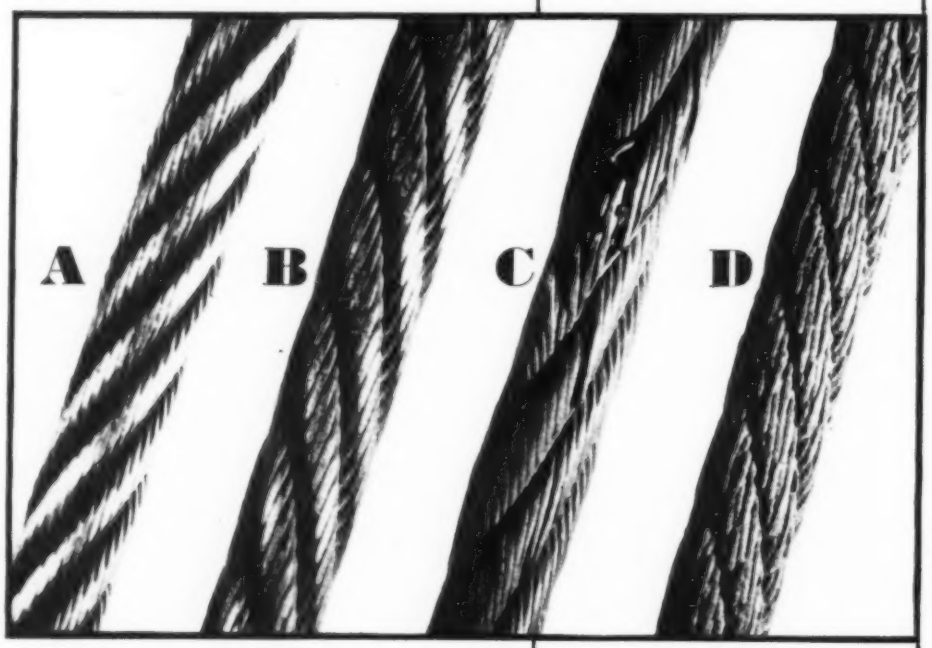
Use Macwhyte Engineering Service—a wire rope or lubrication recommendation may save you many dollars. It's a part of our friendly service to help you get the most from your wire rope dollar.

*For complete information ask for interesting folder, "The WHY IN MACWHYTE Internal Lubrication."

FROM THE FIELD

A This rope contains Macwhyte's Special Internal Lubrication. External lubrication was applied periodically during service. *Result:* Uniform wear, maximum service.

B This rope was internally and externally lubricated with Macwhyte's Special Lubricant during fabrication. It was never externally lubricated in service, however. *Result:* efficient service, but had to be removed prematurely because exposed outer wire became rusty. When removed from job inner wires were still in good condition and well lubricated—indicating that external application of a good lubricant would have prolonged rope life.



C No internal or external lubrication was applied to rope "C." Strands and wires became frozen, which eliminated freedom of wire and strand movement when the rope flexed over sheaves. *Result:* Premature rope failure before wires had received normal wear.

D An idle rope should always be kept lubricated. Rope "D" was removed from service and stored for future use. Not being protected, however, rust and corrosion set in and ruined the rope. *Result:* unnecessary waste and high rope cost that lubrication could have prevented.

MACWHYTE COMPANY
2940 Fourteenth Avenue, Kenosha, Wisconsin
Manufacturers of Rope Wire—Braided Wire Rope Slings—Monel Metal Wire Rope—Stainless Steel Wire Rope—Cable, Tie-Rods, and "Safe-Lock" Terminals for Aircraft; Wire Ropes for all industrial requirements.

NO. 483

MACWHYTE
Whyte Strand
PREformed WIRE ROPE
The Wire Rope with THE Internal Lubrication

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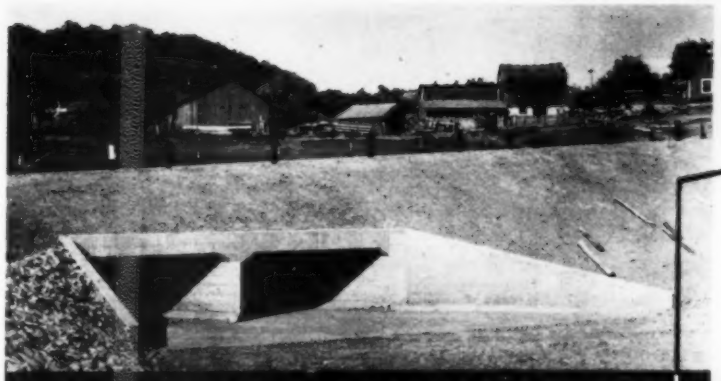
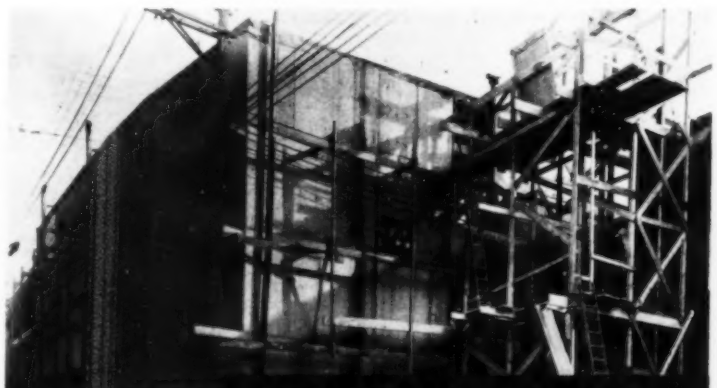


9 DAYS SAVED—FORM COSTS CUT

▶ This culvert, with three others and a bridge, was built on Route 56, Vernon County, Wisconsin, early in the spring. Use of Atlas High Early permitted stripping of forms and opening of road to traffic 5 days after concrete was placed instead of 14 days if normal portland cement had been used. Form costs were cut by earlier stripping and also re-use of forms, and protection and curing costs were reduced appreciably. Engineer, Wisconsin State Highway Commission; Contractor, Nelson, Mullen & Nelson, of Minneapolis.

SAVED $3 PER CU. YD. OF CONCRETE

▶ To meet winter construction problems, the Minneapolis Bridge Co. chose Atlas High-Early for 1700 sq. yds. of paving, 280 sq. yds. of sidewalk, and the retaining walls and deck of this Northern Pacific underpass, Bismarck, N. D. The contractor reported that lower costs for protection and curing saved $3 per cu. yd. This large saving was partly due to the necessity of placing the concrete in a number of operations—no one placement of concrete exceeding 30 cubic yards.



25 DAYS' TIME AND $300 SAVED!

▶ Concreting of Northwestern Bell Telephone Building in Council Bluffs, Iowa, had to be rushed through in winter, with temperatures as low as 18° below zero. Use of Atlas High-Early cement saved 25 days' time, $300 on form costs, and cut protection and curing costs. Architect, J. Chris Jensen; Contractor, C. C. Larsen & Sons; both of Council Bluffs.

Lop days off construction time

CUT DOLLARS OFF COSTS— *with* ATLAS HIGH-EARLY CEMENT

HOW to speed construction and reduce costs—here is a problem that Atlas High-Early cement answers satisfactorily on many jobs. The three jobs here illustrated are typical.

Atlas High-Early gains strength rapidly, and so cuts time and costs required for protection and curing as much as 60-70%; generally permits earlier stripping and re-use of forms, thus often reducing form costs; and produces serviceable concrete in much less than the usual time.

Specify Atlas High-Early on your next job. Fill out and mail the coupon below for new booklet, "Case Histories of Days and Dollars," which gives further data on the speed and economy of Atlas High-Early cement. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, New York City; 208 South La Salle Street, Chicago.

Universal Atlas Cement Co., Dept. CM-H-19
Chrysler Building, N. Y. C.

Please send me, without obligation, your new Atlas High-Early booklet "Case Histories of Days and Dollars."

Name_____

Company_____

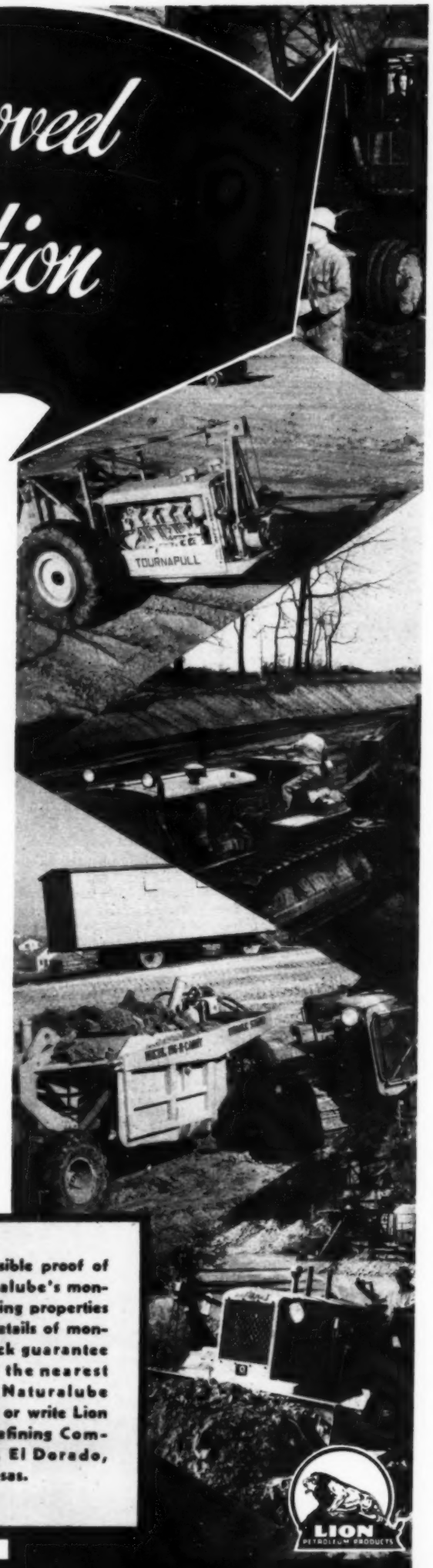
Address_____

City_____ State_____

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

Assure Improved Engine Lubrication



BASICALLY DIFFERENT LUBRICATING OILS have 3 to 10 TIMES STRONGER FILM

KEEP ENGINES CLEANER BY GRADUALLY REMOVING HARD CARBON

Here are lubricating oils that are really fitted for the tough jobs. Naturalube's three to ten times stronger protective film is the highest-type protection against oil-film failure and mechanical breakdown. Furthermore, Naturalube conserves power and makes frequent engine overhauls unnecessary. Its unusual solvent and penetrative properties enable Naturalube to remove hard carbon from pistons, rings and other engine parts. Thus, horsepower is added - fuel is saved - and engine wear is reduced.

Dollars saved on operating and maintenance cost are profit dollars. A thorough trial of Lion Naturalube will convince you of its money-saving, profit-making possibilities.

Naturalube Diesel and Heavy Duty Oil is specially fortified or reinforced to resist the effects of intensified heat and oxidation under extreme conditions. Engines constantly operated at high speeds and or heavy loads need this super lubricant.

LION *Naturalube*

MOTOR OIL and

*** DIESEL AND HEAVY DUTY OIL**

For visible proof of Naturalube's money-saving properties and details of money-back guarantee phone the nearest Lion Naturalube dealer or write Lion Oil Refining Company, El Dorado, Arkansas.

Made by **LION OIL REFINING COMPANY, El Dorado, Arkansas**

THE BID'S THE THING!

You have to get the business first!

You have to be on your toes these days to land the worthwhile contracts. And that means being wise to the new developments in equipment—to the machines that do the job for less money and still leave you a good profit margin. You can't touch today's records with obsolete machines. Recently, the low bidders on a lot of big jobs are the fellows who take advantage of lower production costs with these new P&H's. It's worth your time to get the facts that make it so.

Above is the P&H Model 855 (2 to 2½ yd. excavator) shovel — a fast-working, easy-running machine that is making a big name for itself. It's built entirely of rolled, alloy steels, huskier, more powerful, more dependable.

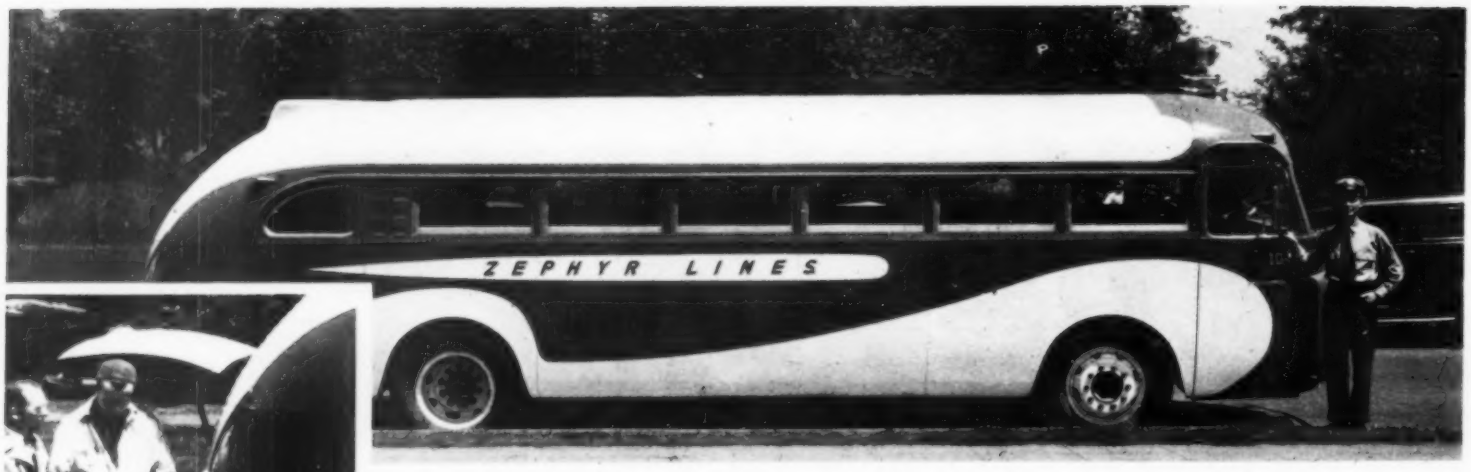
P&H Excavators are built in all sizes from 3/8 to 5 cu. yds. capacity; gasoline, Diesel or electric power. Literature is available on all models.

P&H EXCAVATORS

4494 West National Avenue • Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS



Above—One of the latest type coaches recently added to the Zephyr Lines fleet operating out of the Twin Cities.

Left—D. R. Stapleton, Standard Automotive Engineer, and B. I. Stigsell, maintenance superintendent of the Zephyr Lines, re-checking a bus engine for efficiency after adjustments have been made. This double checking locates engine troubles that might not otherwise appear.

HERE'S WHY STANDARD OIL PRODUCTS "RIDE WITH" ZEPHYR LINES

Mr. William Quist, President of Zephyr Lines, Minneapolis, gives two good reasons why Standard Oil products now "ride with" Zephyr Lines.

First, he says:

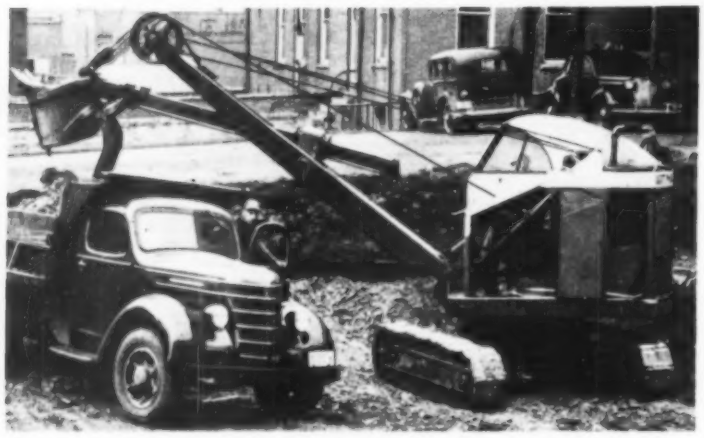
> "Starting with new equipment we expected no particular problems or trouble in our operation or maintenance. It was not long, however, before we needed some suggestions and recommendations. Your Automotive Engineer came to us at that time, helped us out, and since then has offered many valuable suggestions."

These "valuable suggestions" covered many phases of operation, from helping the fleet maintenance men locate the cause of motor block failures to checking engine efficiency. It is estimated that this service has already lowered maintenance costs 20%.

Again, Mr. Quist says:

> "We thought at one time to increase our revenue by buying the cheaper brands of gasoline. Heavy detonation in our engines accompanied by a marked loss of power was the result of this experiment. We lost more than we gained, even though we tried to compensate for this condition by ignition and carburetor changes.
>
> "Standard Oil of Indiana's products have proved their ability to save us money and give top performance under all conditions. As we increase our field operation, these products will ride with us."

This same engineering service and the same products which Mr. Quist finds so valuable are available to you if you operate in the Middle West. You can reach one of these Engineers through any local Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois, for the engineer nearest you.



CONTRACTOR'S FLEET IS 20% MORE EFFICIENT ON STANDARD RED CROWN

Sticking valves, vapor lock and high oil consumption were a few of the troubles that prompted Art Mann, contractor at Goodhue, Minnesota, to call a Standard Automotive Engineer. Here again a thorough check of the 12 trucks, 2 tractors, and 2 shovels by the engineer and a change to Standard Red Crown and Standard Oil lubricants has eliminated operating troubles and increased fleet efficiency 20%.

ENGINEER RIDES DAIRY FLEET... BEATS CARBON TROUBLE

Where fleet engines must operate under unusual or severe conditions, such as in dairy delivery trucks, Standard Automotive Engineers have portable equipment for making tests on the road. Such tests on the Country Club Dairy equipment pictured at the right reduced carbon removal costs 50%.

Regardless of the type of fleet you operate—modern buses, cross-country tractor-trailers, or heavy construction units—you'll find Standard Automotive Engineering Service a valuable aid in keeping fleet costs in line.

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where others fear to tread

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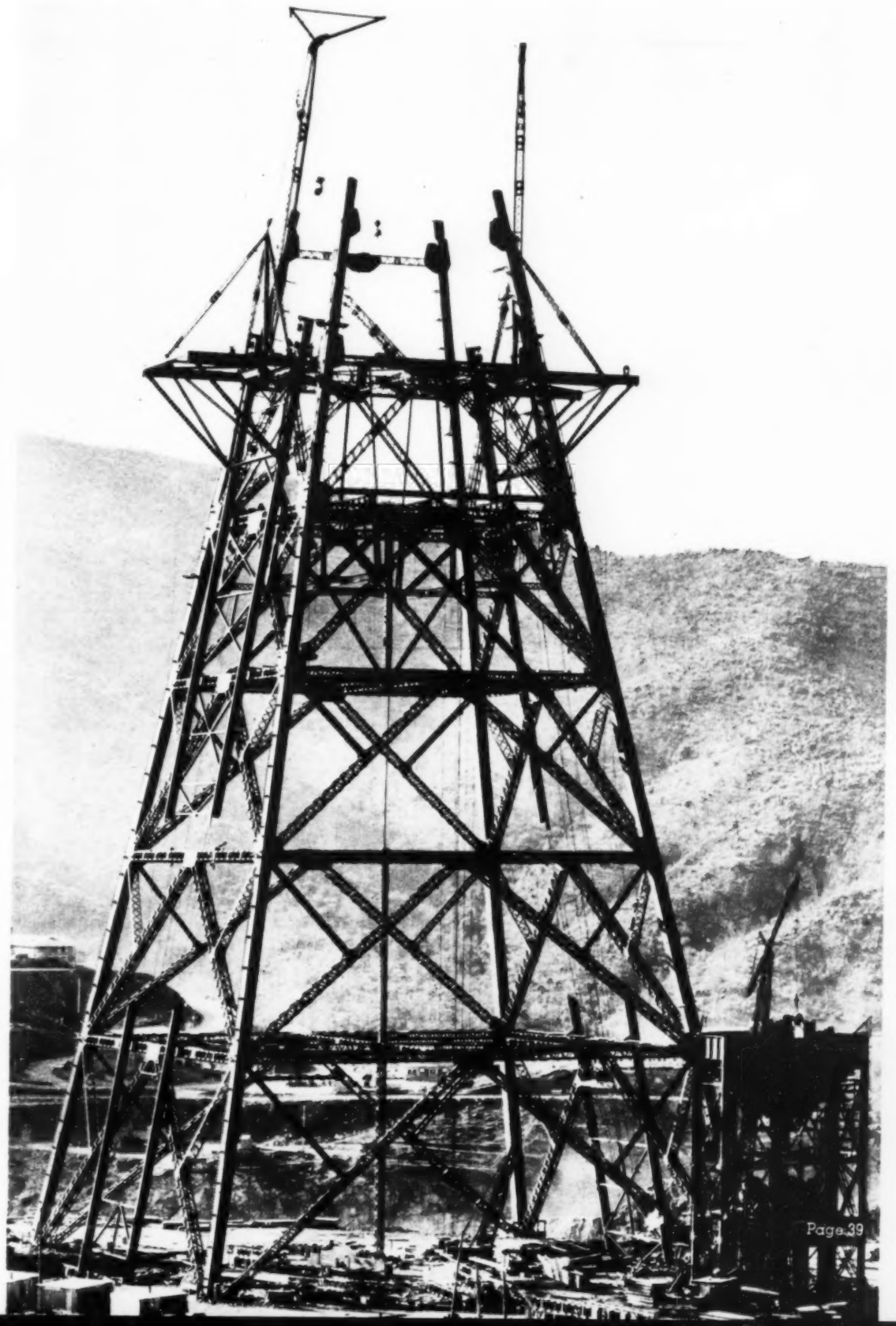
Construction Methods

ROBERT K. TOMLIN, Editor

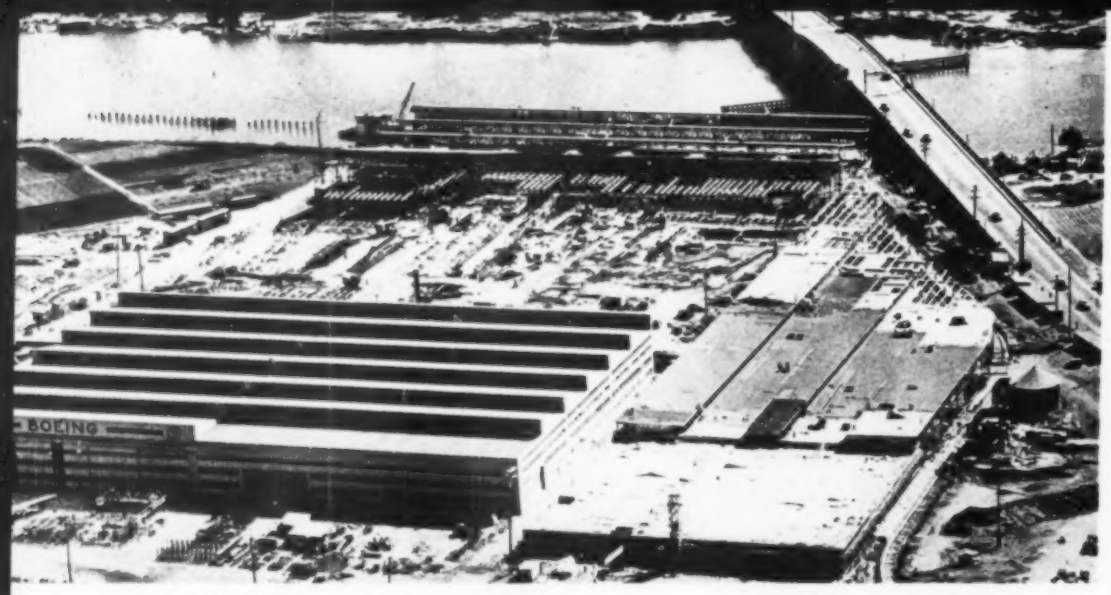
Volume 22 | SEPTEMBER, 1940 | Number 9

Creeper Cranes ERECT HEAD TOWER AT SHASTA DAM

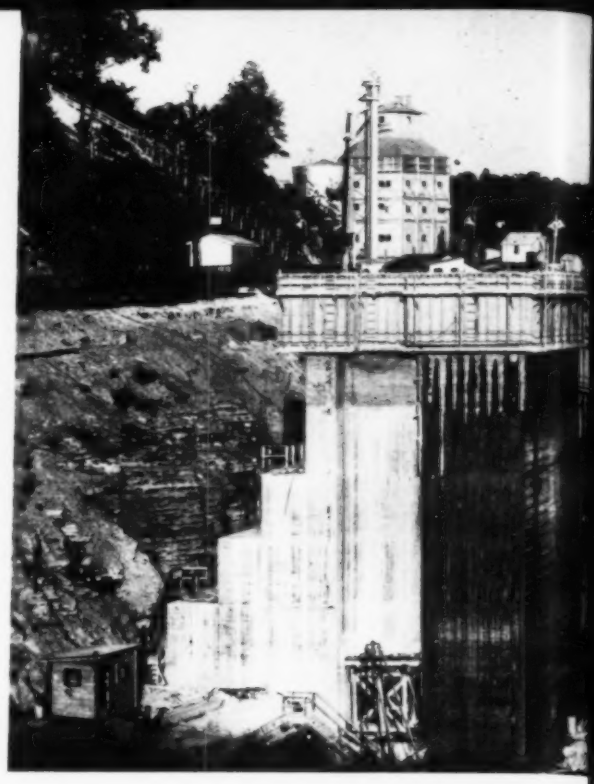
THE HEAD TOWER for the seven radial cableways used in placing concrete at Shasta Dam was erected with the aid of two creeper cranes which advanced up opposite sides of the tower as erection proceeded. The tower contains 2,576 tons of structural steel and is 560 ft. high of which 460 ft. is above the fill around the tower base. The cranes were of sturdy design as they had to handle single pieces weighing as much as 42 tons. Hoisting engines were on the ground at the tower base and the track up which each crane moved was advanced a section at a time as the crane worked up, thus making it unnecessary to provide enough track to go all the way up the tower. When erection was completed the cranes moved downward in reverse erection procedure, taking out a section of the track above and placing it below until the cranes were on the ground and the tracks were entirely removed.



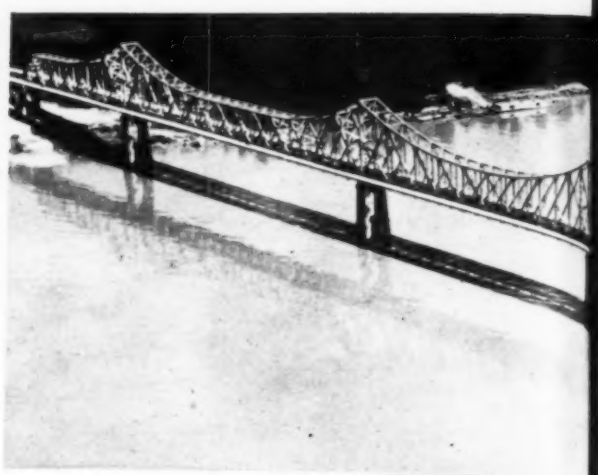
Photo, U. S. Bureau of Reclamation



FOR INCREASED AIRCRAFT PRODUCTION the Austin Co., of Cleveland, Ohio, is building this $2,000,000 addition to plant of Boeing Aircraft Co. in Seattle, Wash. Additional space of 600,000 sq. ft. is involved in present construction program to house manufacture of twin-engine attack bombers.

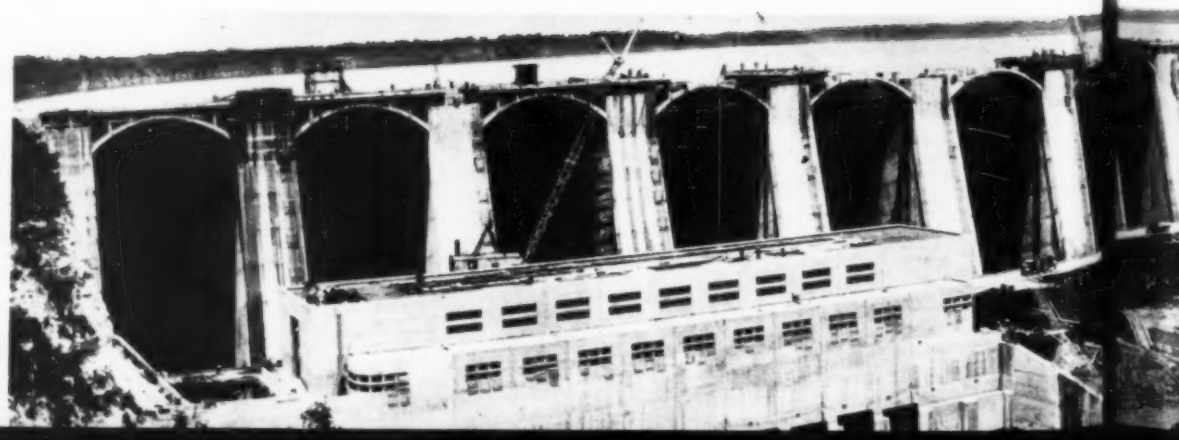


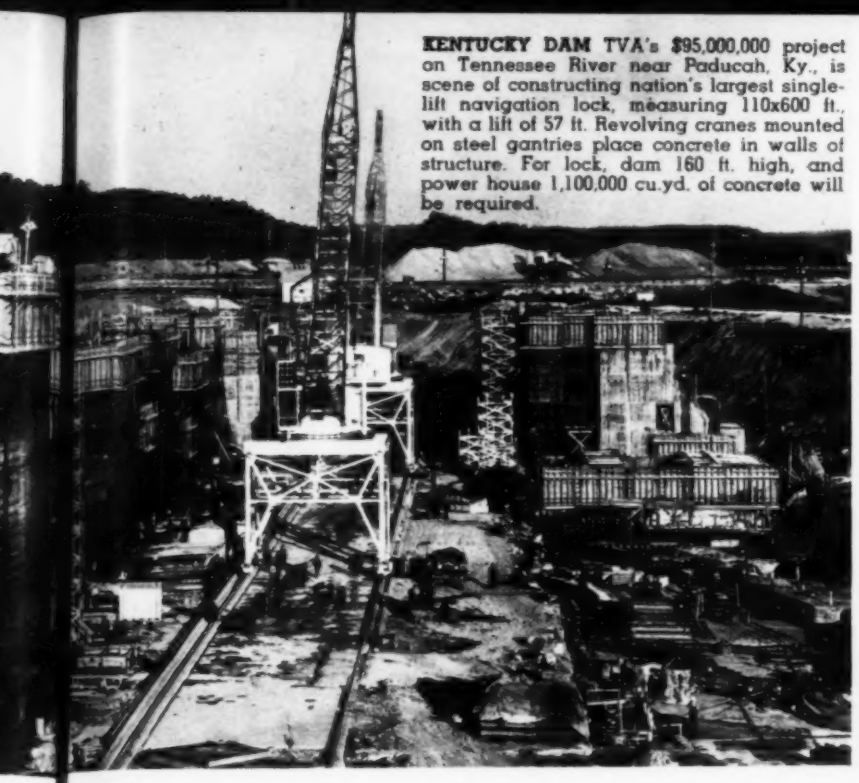
MILITARY VALUE of Pennsylvania Turnpike, 160-mi. superhighway between Pittsburgh and Harrisburg, Pa., costing $60,000,000, is tested Aug. 7 as First Battalion of 108th Field Artillery, Pennsylvania National Guard makes 135-mi. dash from Indiantown Gap to Bedford during summer maneuvers. Divided road has four 12-ft. concrete-paved traffic lanes.



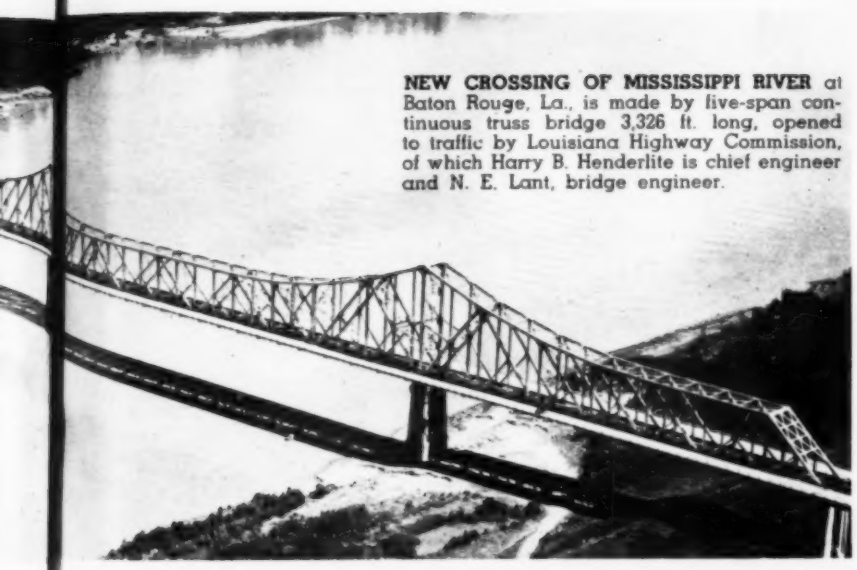
JAMESTOWN BRIDGE, $3,000,000 steel structure 6,600 ft. long crossing Narragansett Bay, Rhode Island, is opened to traffic Aug. 3 as JOHN M. CARMODY (right), Public Works Administrator of Washington, D. C., participates in ceremonies in which comely New England lasses form "Ribbon of Beauty" across concrete-paved roadway.

THIS MONTH'S NEWS REEL

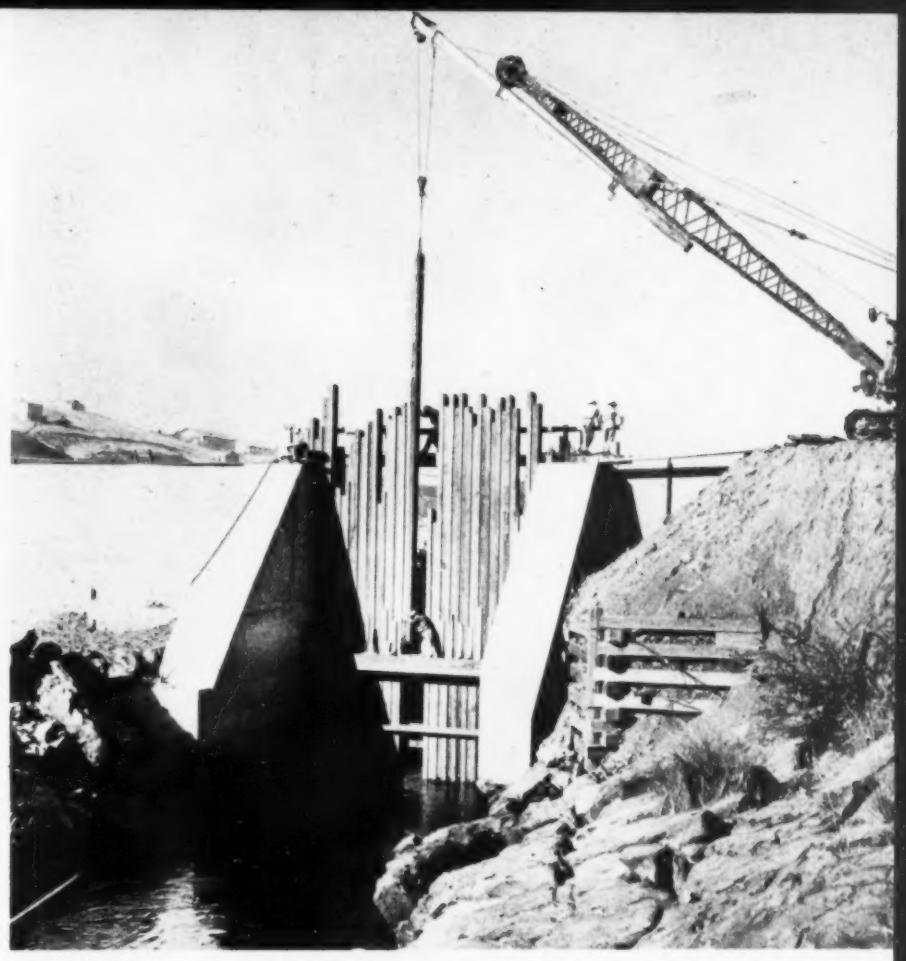




KENTUCKY DAM TVA's $95,000,000 project on Tennessee River near Paducah, Ky., is scene of constructing nation's largest single-lift navigation lock, measuring 110x600 ft., with a lift of 57 ft. Revolving cranes mounted on steel gantries place concrete in walls of structure. For lock, dam 160 ft. high, and power house 1,100,000 cu.yd. of concrete will be required.

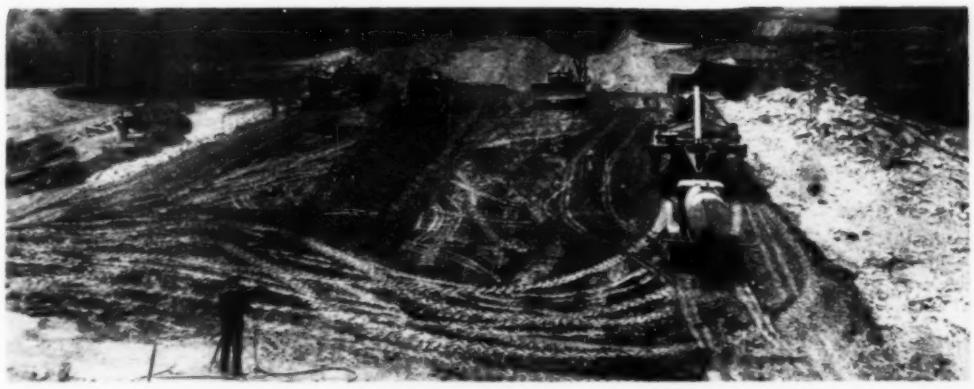


NEW CROSSING OF MISSISSIPPI RIVER at Baton Rouge, La., is made by five-span continuous truss bridge 3,326 ft. long, opened to traffic by Louisiana Highway Commission, of which Harry B. Henderlite is chief engineer and N. E. Lant, bridge engineer.

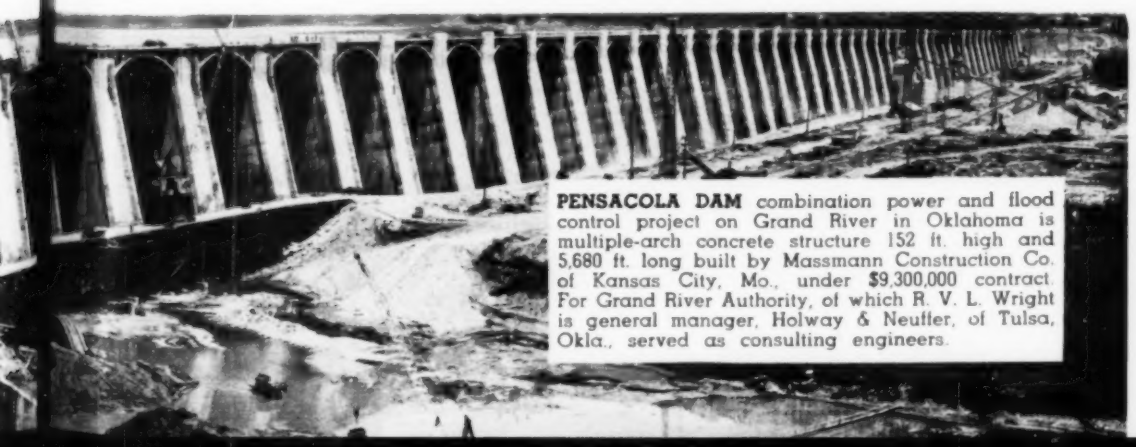


DIVERSION OF SAN JOAQUIN RIVER into temporary side channel at Friant dam, U. S. Bureau of Reclamation project in California, is effected July 29 by closing with steel sheetpiling 25-ft. opening in upstream cofferdam.

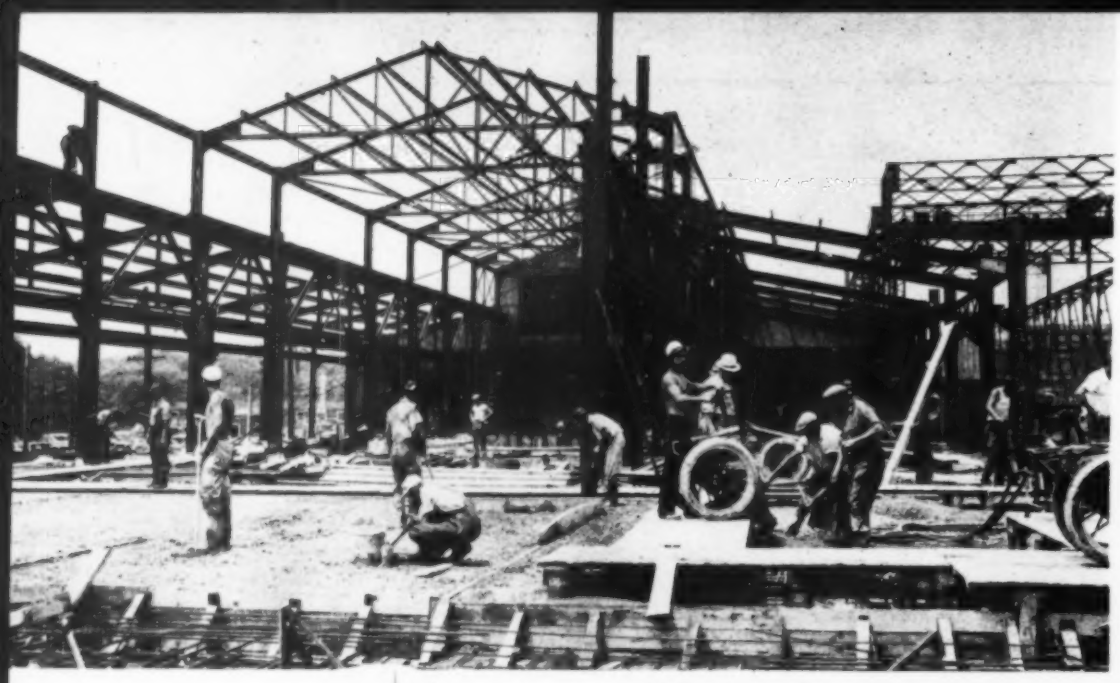
FIRST CONCRETE AT FRIANT DAM (right), U. S. Bureau of Reclamation structure in California involving 2,200,000 cu.yd., is placed by 4-cu.yd. bucket July 29. HARVEY SLOCUM (left) superintendent for Griffith Co. and Bent Co., contractors, receives congratulations from R. B. WILLIAMS, construction engineer for Reclamation Bureau.



INDIAN ROCK DAM on Codorus Creek near York, Pa., is scene of earth-moving activity as equipment of Benjamin Foster Co., contractor, of Philadelphia, comprising trucks, tractor-hauled scrapers, bulldozers, sheepsfoot rollers and sprinkling tank truck, place rolled earth embankment with rock-surface slopes for 80-ft.-high structure, 1,000 ft. long on crest. Flood control structure to cost $1-206,000 is being built for U. S. Engineer Department under direction of Col. W. A. Johnson, district engineer, with headquarters at Baltimore, Md.



PENSACOLA DAM combination power and flood control project on Grand River in Oklahoma is multiple-arch concrete structure 152 ft. high and 5,680 ft. long built by Massmann Construction Co. of Kansas City, Mo., under $9,300,000 contract. For Grand River Authority, of which R. V. L. Wright is general manager, Holway & Neuffer, of Tulsa, Okla., served as consulting engineers.



CONCRETE FLOOR CONSTRUCTION at rate of two bays every second day keeps one step ahead of steel erection. High-early-strength concrete attains required ultimate strength in 3 days.

ROLLER-GATE BUCKET handled by truck crane discharges concrete into floor hopper. High-frequency hydraulic vibrator in foreground facilitates flow of concrete around reinforcement.

TWO-GATE FLOOR HOPPER (below) and pneumatic-tired carts distribute 200 cu.yd. of concrete for two floor bays in 5 hr. Portable gasoline-powered units operate hydraulic vibrators.

Early-Strength Cement

AIDS HIGH-SPEED CONSTRUCTION OF FOUNDRY EXTENSION

HIGH-SPEED CONSTRUCTION at normal cost marked the erection in 70 working days of a quarter-million-dollar foundry extension by the Turner Construction Co., contractor, New York, for the Bullard Co., Bridgeport, Conn., a machine tool manufacturer pressed for additional facilities to fill orders resulting from industrial expansion for national defense. Operating on a normal 40-hr. weekly schedule which avoided undue payment of double rates for skilled labor after hours and on week-ends, the contractor completed a reinforced-concrete and steel frame mill-type structure on concrete pile foundations between June 4 and Sept. 10 and turned 40 per cent of the building over to the owner's use on Aug. 10, at the end of 46 working days.

Fast work by a single crane-operated

TIMBER SHORES set at about 3x4-ft. centers on 3x12-in. plank sills support 4x6-in. stringers under floor forms.

FAST PROGRESS on normal 40-hr. weekly schedule is directed for Turner Construction Co. by E. A. COURTER (right), superintendent, observing placement of early-strength floor concrete with WM. HEPBURN, engineer, service department, Lehigh Portland Cement Co.

BOOM AND JIB with overall reach of 125 ft. are able to set steel from one side clear across 94-ft. width of building.

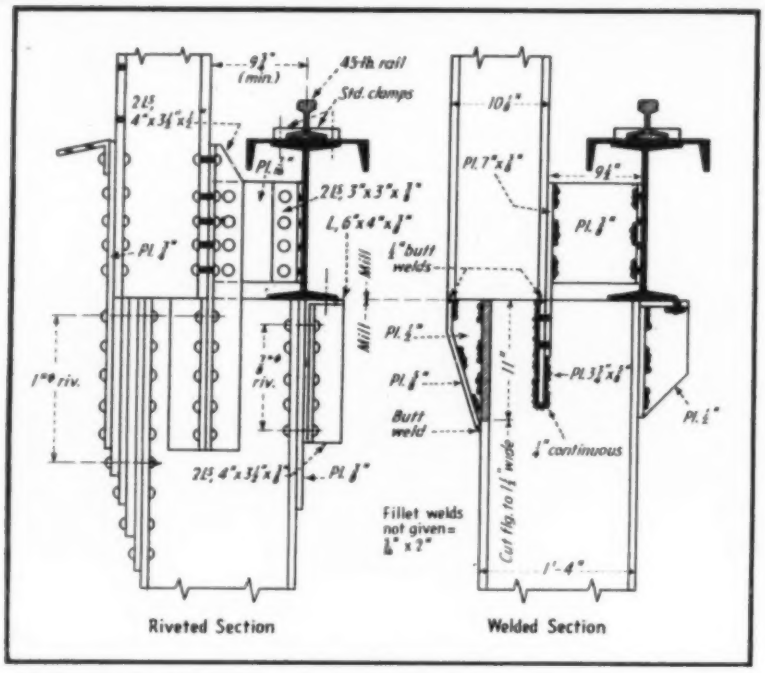
driver of the Raymond Concrete Pile Co., subcontractor, completed the installation of 565 step-tapered concrete piles in 19 working days to July 1, double shifts being employed with the piledriver for two weeks of this period. To expedite construction and eliminate difficulties of shoring a heavy reinforced-concrete floor extending the entire length and breadth of the building, 360x94 ft., the general contractor utilized high-early-strength concrete which attained required ultimate strength in 3 days. Close cooperation by the Lehigh Structural Steel Co. in delivering shop welded superstructure framing units enabled steel erection to follow immediately upon the heels of concrete construction. Field connections were riveted.

Quick Start — Authorization to proceed with plans and construction was given by the owner late on Friday, May 10 to Alexander D. Crosett, New York, engineer and architect for the building, and to the Turner Construction Co., contractor. Plans were quickly prepared by Mr. Crosett's office, and the Turner Construction Co. was able to issue a work order to its foundation subcontractor, the Raymond Concrete Pile Co., on

CLOSE BEHIND PLACING of structural floor concrete crew spreads ¾-in. topping which is hard-troweled to smooth finish.

PILEDRIVING LEADS rigged up on boom of 80-ton steam crawler crane put down 565 step-tapered piles 16 to 48 ft. long for Raymond Concrete Pile Co. in 19 working days, operating double shifts for about half of this time.

BACKING UP JOB MANAGEMENT for Turner Construction Co. are: (left to right) G. P. MORRISON, timekeeper; SPENCER ROBINSON, job accountant; GEORGE SIMPSON, responsible for lines and grades; and E. H. ANDRESEN assistant superintendent.



SUBSTITUTION OF WELDED DESIGN for riveted connection in main craneway columns saves weight and improves appearance. Erected craneway columns can be noted in an accompanying photograph.

May 31. The first steel drawings were supplied at about the same time to the Lehigh Structural Steel Co., subcontractor for fabrication and erection, to start laying out and fabricating the shop-welded steel frame elements.

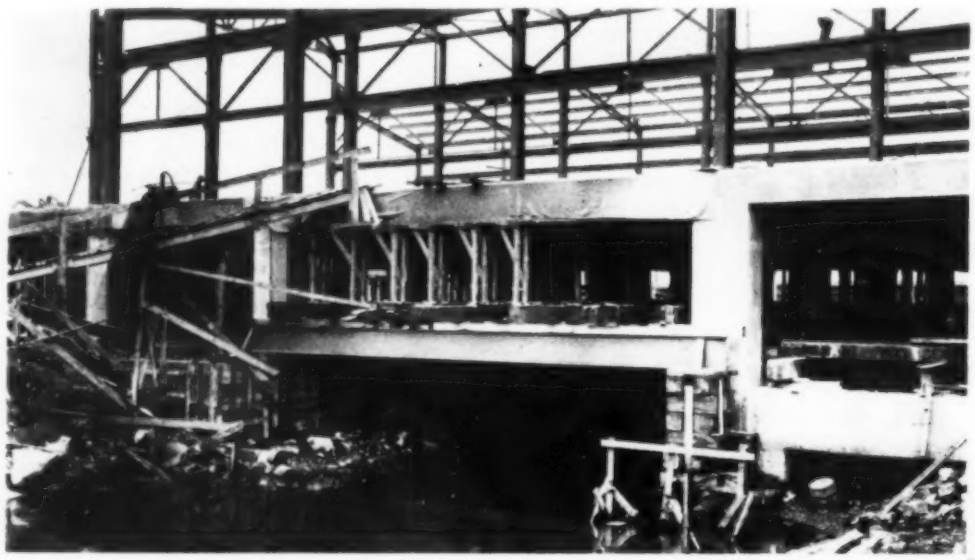
An 80-ton-capacity steam crawler crane and detached piledriving leads arrived at the job June 3. The piledriver was assembled and rigged in 6 hr., and the first piles were driven on the following day, June 4.

Foundry Extension—Adding 360 ft. to the length of an existing foundry building 94 ft. wide, the extension covers almost 34,000 sq.ft. of ground area and incloses two floors, an unfinished basement for pattern storage and a reinforced-concrete first floor designed for live loads up to 800 lb. per square foot. Six longitudinal lines of reinforced-concrete columns support the first floor and divide the basement transversely into five bays of varied width. In the longitudinal direction, the basement is divided by transverse rows of columns into seventeen bays which, with three exceptions, have a uniform length of 20 ft. Above the first floor, the superstructure is typical steel frame mill building construction, with three longitudinal craneway bays of varied width and a monitor roof covered with corrugated Transite. Walls of the monitor and of the building are steel sash above masonry spandrel curtains about 3½ ft. high, built of concrete in the basement and of brick on the first floor.

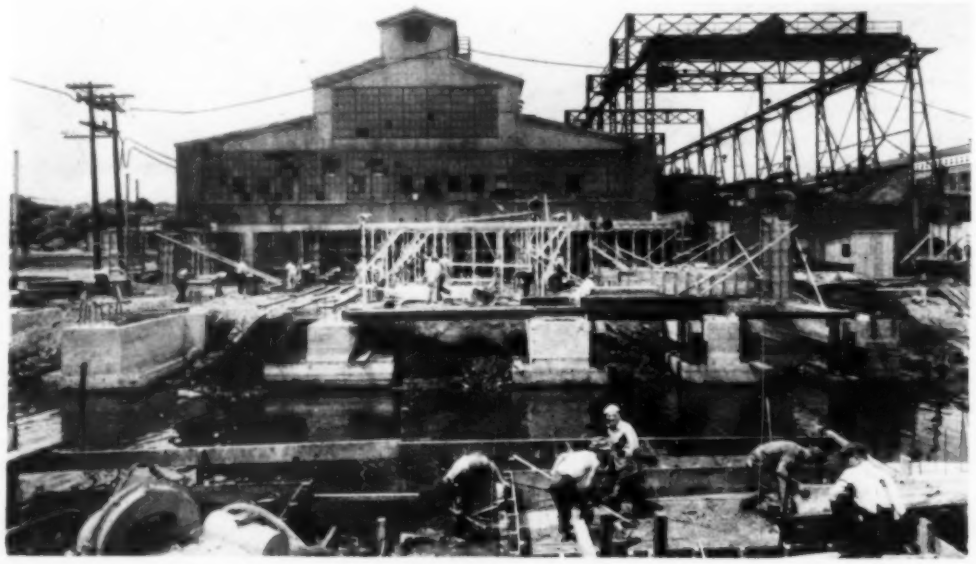
Early-Strength Concrete

Ground conditions were an important consideration leading to a decision to use high-early-strength concrete for the first floor. Land at the site consists of relatively light cinder fill on marsh muck. The thin crust was estimated to be capable of sustaining no more than

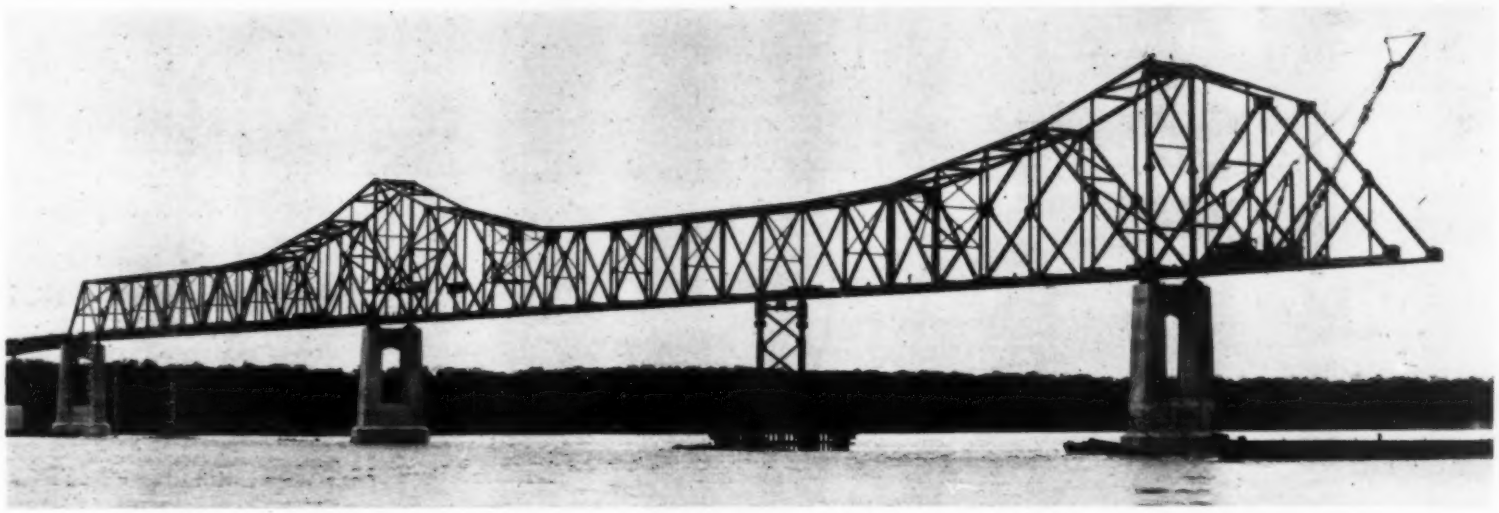
(Continued on page 96)



CLEARING INTERSECTING STREAM by 8 ft. at low tide, steel beams support falsework under 32-ft. 8-in. beam-and-girder span. Short-length timber shores are left in place because there is no other use for them on job.



AT STREAM CROSSING, concrete piers on pile foundations are constructed to carry beam-and-girder bay over water.



MAIN CANTILEVER SPAN is 840 ft. long and each of two side spans is 640 ft. View shows temporary falsework bent used during erection of steel, of which 10,700 tons went into structure.

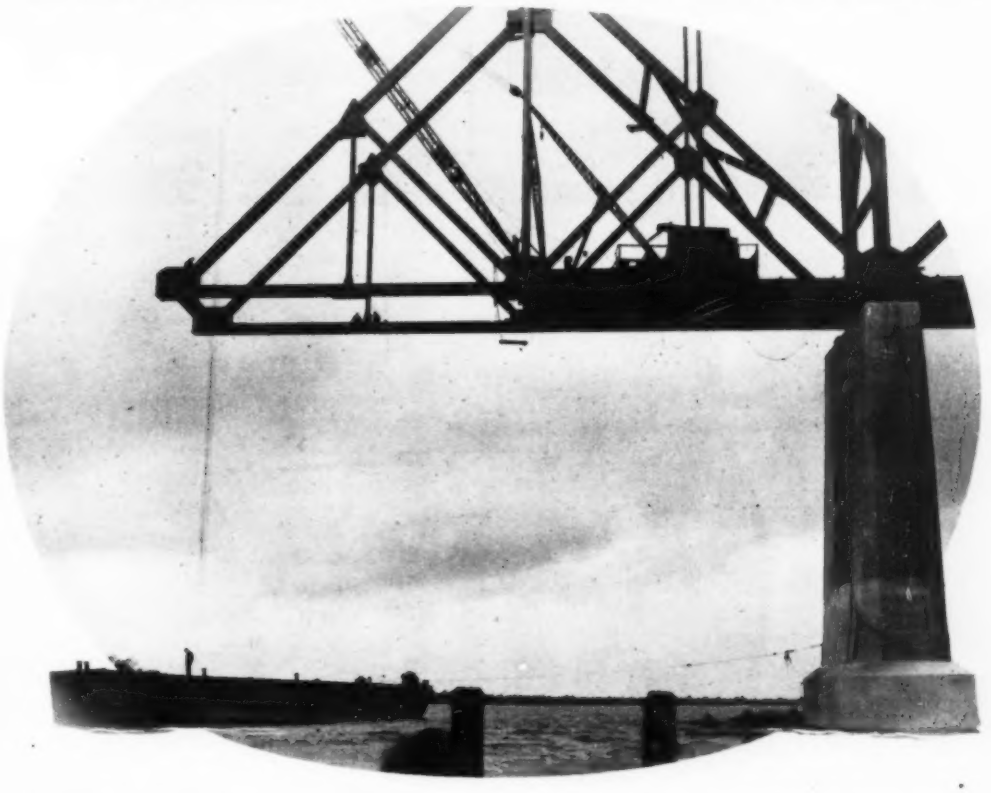
NEW BRIDGE OF *Cantilever Type* SPANS MISSISSIPPI

CROSSING THE MISSISSIPPI RIVER between Greenville, Miss., and Lake Village, Ark., a new steel bridge of the cantilever type, with a total length between abutments of 9,957 ft., has been completed at a total cost, based on the successful bids, of $3,737,310.

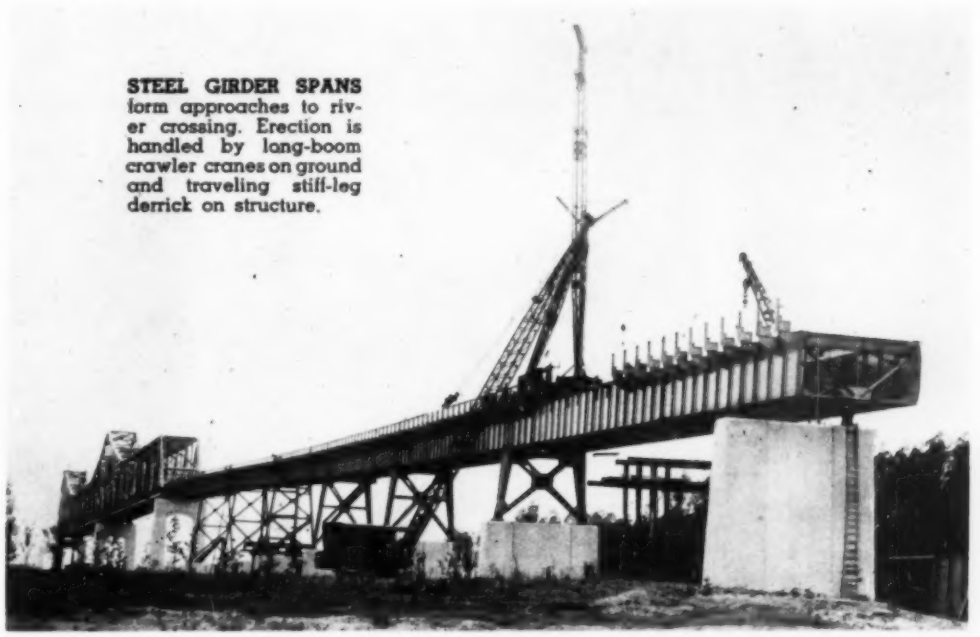
The bridge was built by the City of Greenville, with a 55 per cent loan from the Reconstruction Finance Corporation and a 45 per cent grant from the Federal Public Works Administration. Ash-Howard-Needles and Tammen acted as designing and supervising engineers.

The structure required the placing of 43,000 cu.yd. of concrete and the erection of 10,700 tons of structural steel. Truss span lengths are: One main span of 840 ft. and two side spans of 640 ft. Girder span lengths are: Two of 219 ft., twelve of 180 ft., two of 146 ft., sixty-two of 75 ft., and five varying from 63.5 to 53.5 ft.

The American Bridge Co. fabricated and erected the steel superstructure; the Forcum-James Co. constructed a tollhouse and administration building and installed the bridge lighting system; the Burdine Construction Co. paved the approach embankments. The F. V. Ragsdale Co. and Massman Construction Co. completed the substructure contracts.



DERRICK TRAVELER raises structural steel members from barge and erects them in truss of cantilever span.



STEEL GIRDER SPANS form approaches to river crossing. Erection is handled by long-boom crawler cranes on ground and traveling stiff-leg derrick on structure.

Floating Pipe Pole Erects

150-Ft. Steel Towers

For Night Baseball Floodlighting

ILLUMINATED PLAYING FIELD, with four of eight towers ablaze with light in background, is scene of night baseball game between Pittsburgh "Pirates" and Boston "Bees".

By J. D. YOUNG

Agency & Specialties Division, Westinghouse Electric & Manufacturing Co.

and

J. H. ZORN

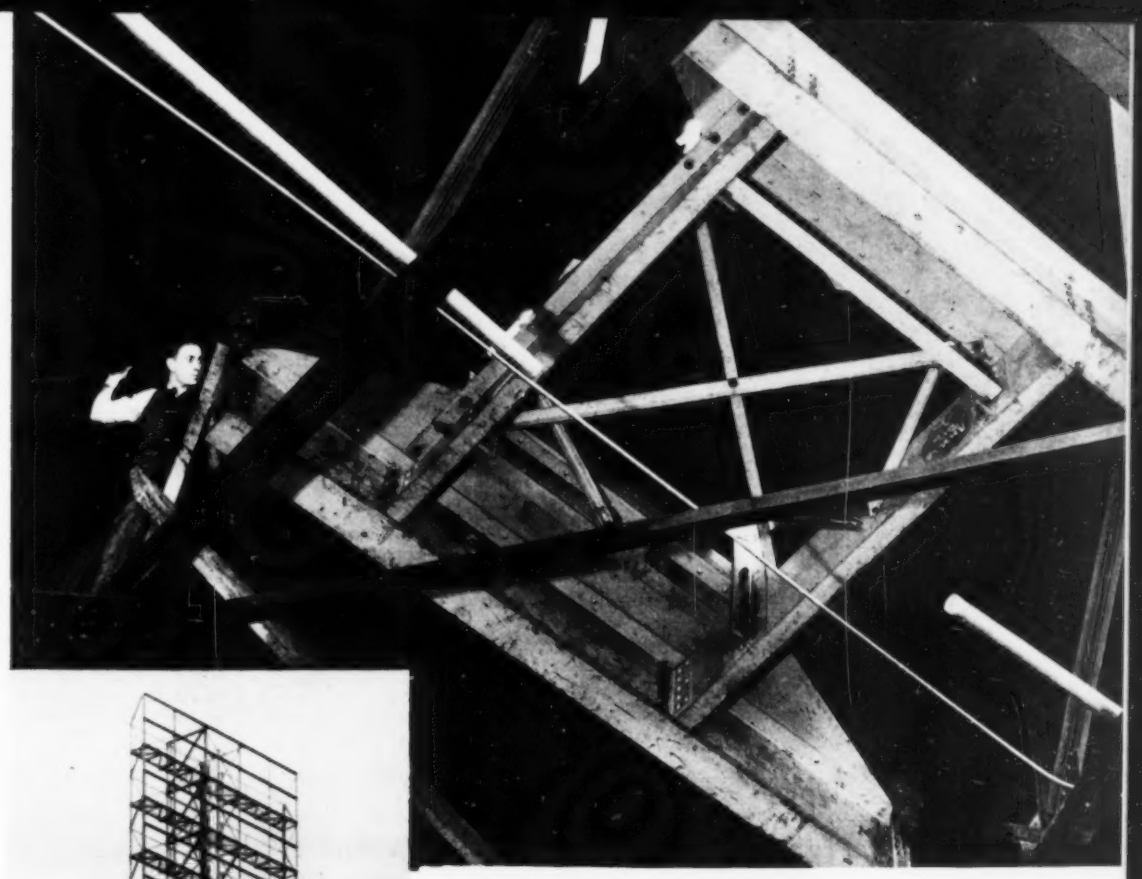
Construction Manager, Tower Dept., American Bridge Co.

2 ATOP COMPLETED FIRST SECTION of tower workmen, with aid of floating pole, lower into position ladder which will be bolted to tower.

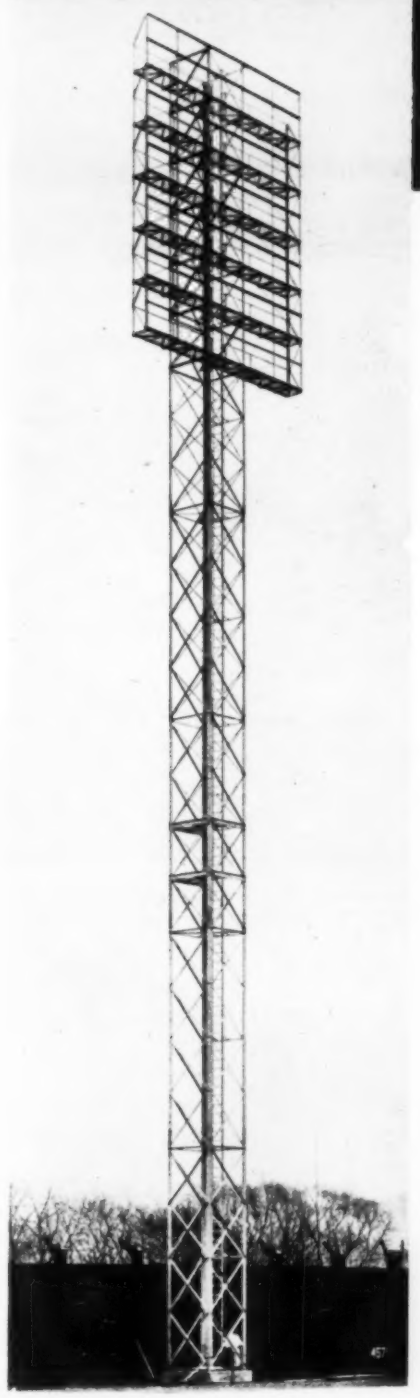
1 FIRST 25-FT. SECTION (below) of 150-ft. free standing tower receives final bolts. Floating pipe pole has just been made fast to hoist succeeding section of tower.

3 LOOSELY BOLTED HALF of second section of 150-ft. tower is anchored in place. Loosely hanging angle braces are ready for bolting to other half when it is raised into position.

4 **THIRD SECTION OF GRANDSTAND TOWER** is hoisted into position by tackle attached to floating-pole, which is deflected under load. Pole is supported by cable slings.

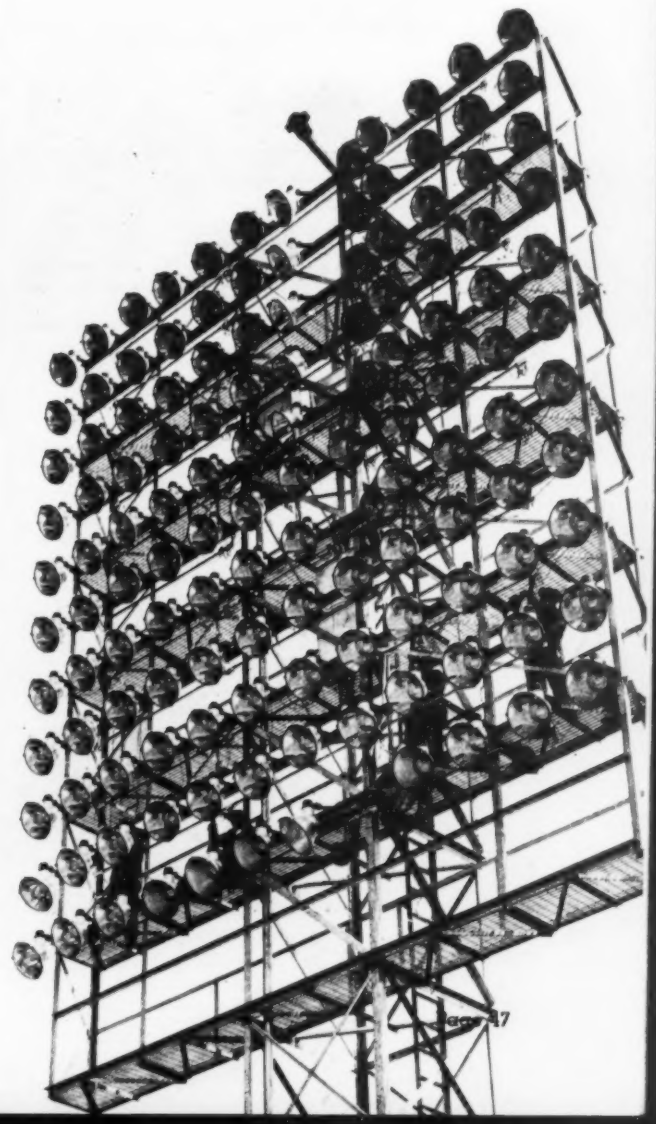


5 **STRUCTURAL STEEL BASE** underneath grandstand roof supports floodlighting tower. Base bridges two roof trusses. Tower uprights project through roof.



6 **COMPLETED TOWER** 150 ft. high is ready for installation of 132 floodlighting units to illuminate portion of outfield. Two thick cross members near center of tower will support two transformers for lights.

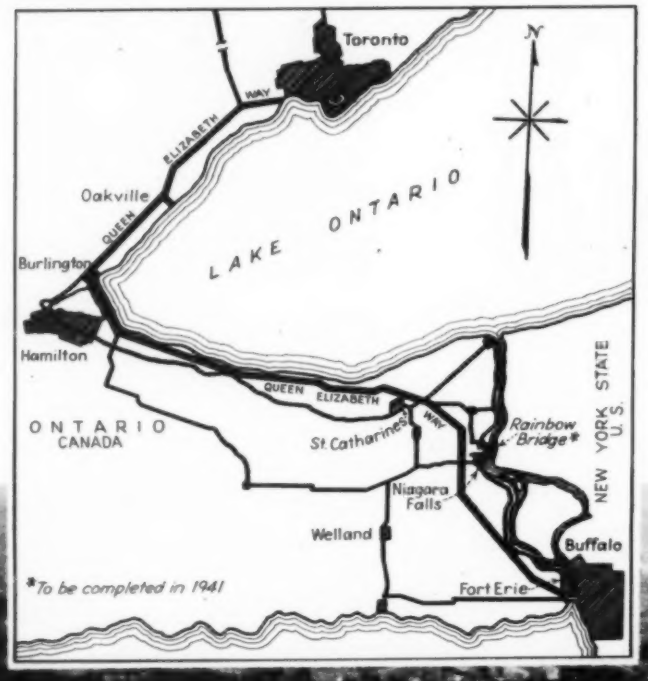
7 **CROSS-ARMS ON 150-FT. TOWER (below)** carry 132 Westinghouse floodlights. Most of wiring was done before reflectors were put in place. Metal catwalks on cross-arms offer platforms for servicing lights.



WITH THE RAPID GROWTH of night baseball, the lighting of major league baseball parks has developed into a highly specialized industry. The reason for this is that the lighting requirements for baseball are in some respects radically different from those of other sports, for instance, football. Much has been written on the design of lighting for major league parks, but very little stress has been placed upon the unusual construction features necessitated by their specialized lighting. This article will attempt a description of some of the features that became part of the latest national league park to be lighted, Forbes

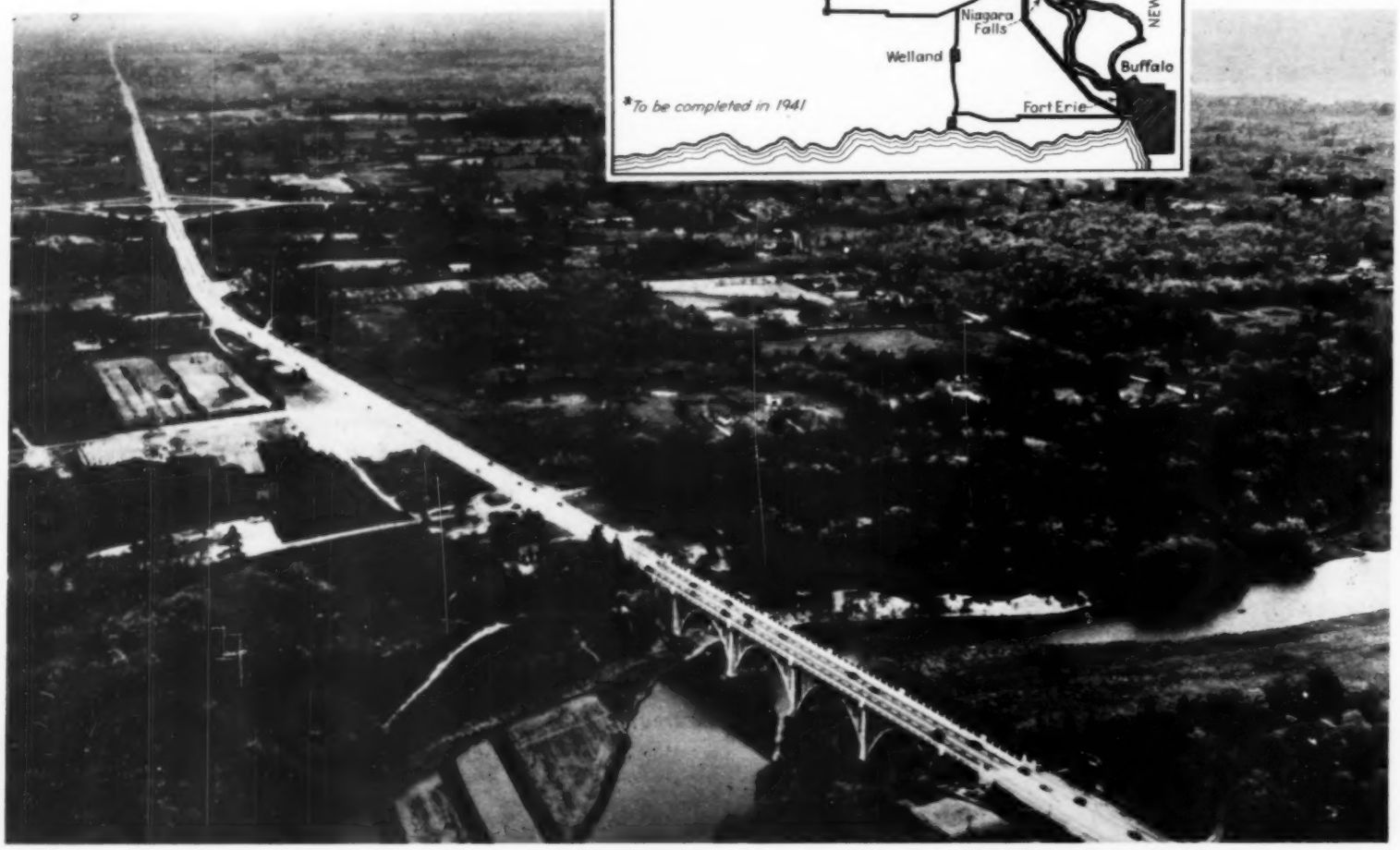
(Continued on page 104)

Canada Builds 91-Mile *Express Highway* Involving 50 Bridges and 23 Grade Separations



91-MI. ROUTE (left) of four-lane Queen Elizabeth Way includes many 10-mi. lengths with no curves.

Photos, Herb Foster



LONG, STRAIGHT SECTIONS of divided-lane superhighway will carry swift-moving traffic safely. In the foreground multiple-arch bridge spans Credit River south of Toronto. In background is Port Credit cloverleaf intersection.

TWIN HALVES OF HENLEY BRIDGE are multiple-arch concrete structures designed for widening to care for increased traffic demands of future.

CANADA'S FIRST DIVIDED-LANE EXPRESS HIGHWAY, the Queen Elizabeth Way, provides a 91-mi. concrete-paved arterial route of modern design linking Fort Erie, Niagara Falls and Toronto. Built at a cost of about $120,000 a mile, the Queen Elizabeth Way involves a total expenditure of $11,000,000. Four lanes are provided over the entire 91 mi., with opposing traffic separated by a grass parkway often 50 ft. wide. Cars going in each direction have a 23-ft. roadway, with an 11-ft. driving lane and a 12-ft. passing lane. The pavement is a 9-in. thick concrete slab on a foundation of 6-in. of gravel.

Whereas there are 140 curves of 25 deg. or more on the old Hamilton-Toronto road, the Queen Elizabeth Way has only 23 curves on the same stretch—none of them greater than 2 deg. For

CLOVERLEAF INTERSECTION facilitates traffic movement at Port Credit where highway extends in straight line for many miles.

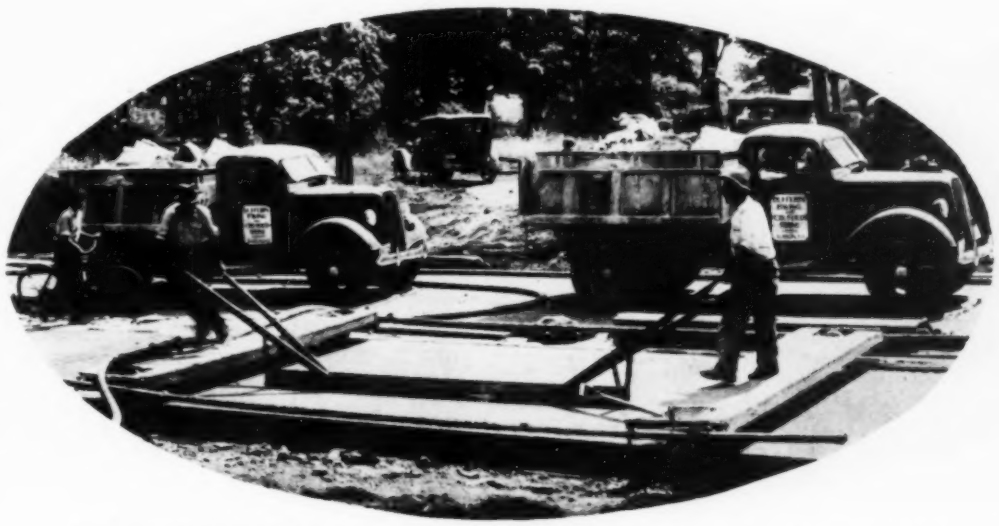
SEMI-CLOVERLEAF on 91-mi. route provides spur connection with express highway near Burlington.

stretches averaging 10 mi. in length the highway is as straight as a die. Grades are limited to 3 per cent. Many trees and a variety of shrubbery have been left standing in the center parkway to screen the glare of approaching car lights. With additional planting, now being done, the problem of night glare on the Queen Elizabeth Way eventually will be largely eliminated.

Numerous Safety Features

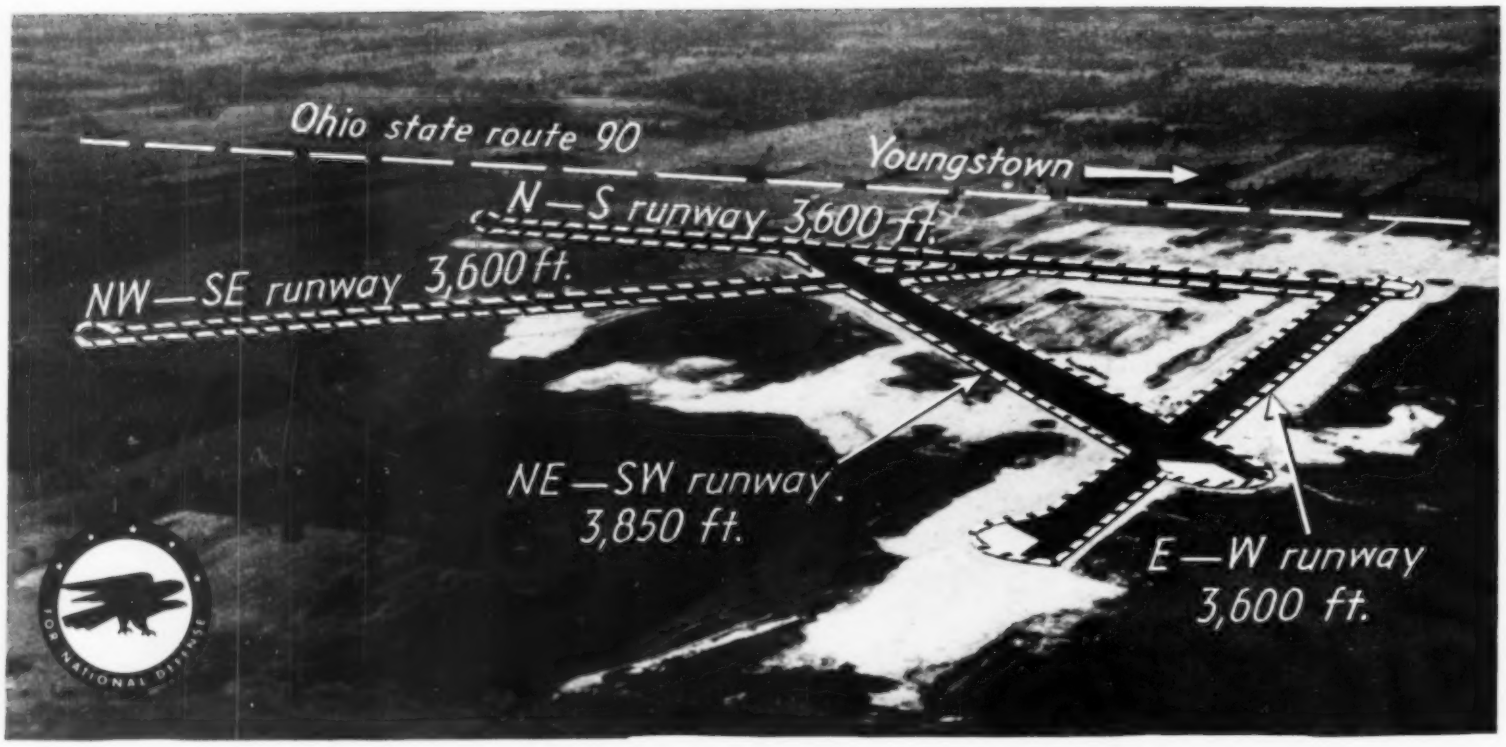
From the driver's standpoint, design feature makes the highway as nearly fool-proof a road as engineers can devise. In addition to a central strip separating traffic moving in opposite direc-

(Continued on page 102)



LONGITUDINAL FLOAT is used to finish 9-in. thick concrete pavement on four-lane route.

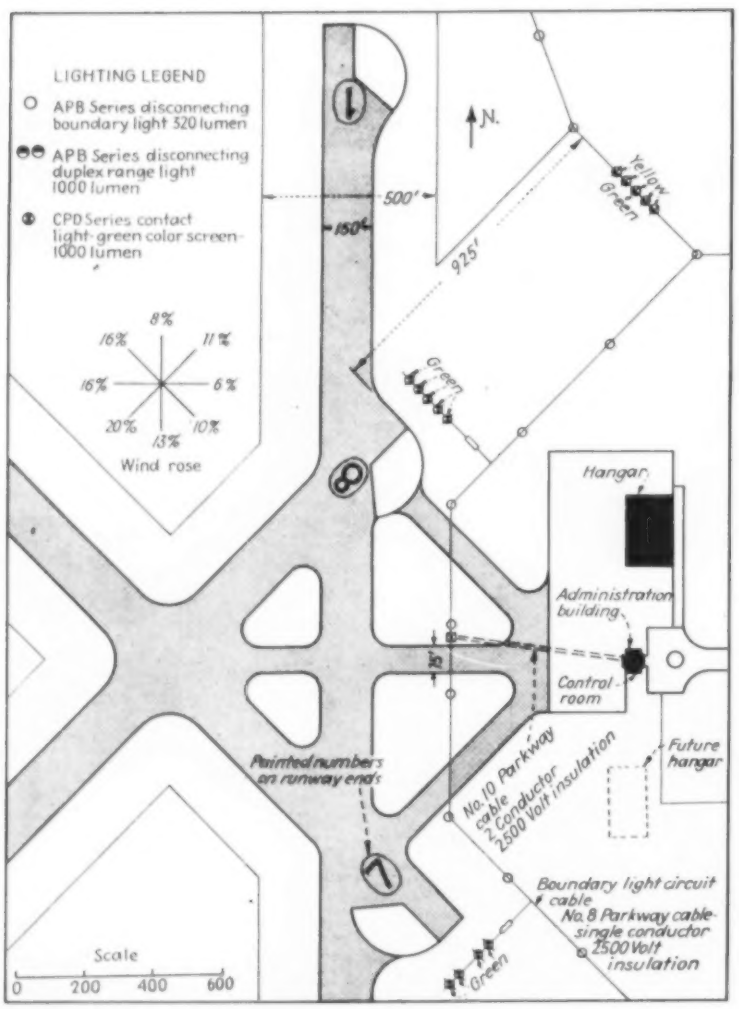
SMOOTH FLOW OF TRAFFIC entering or leaving the superhighway is assured by cloverleaves, such as this one at Port Credit.



FOUR 150-FT. RUNWAYS, 3,600 to 3,850 ft. long, enable pilots to set down their planes from any direction on table-top air field at Youngstown, Ohio, municipal airport.

Airport Runways

SURFACED WITH SLAG-ASPHALT ON DRAINED CLAY SUBGRADE



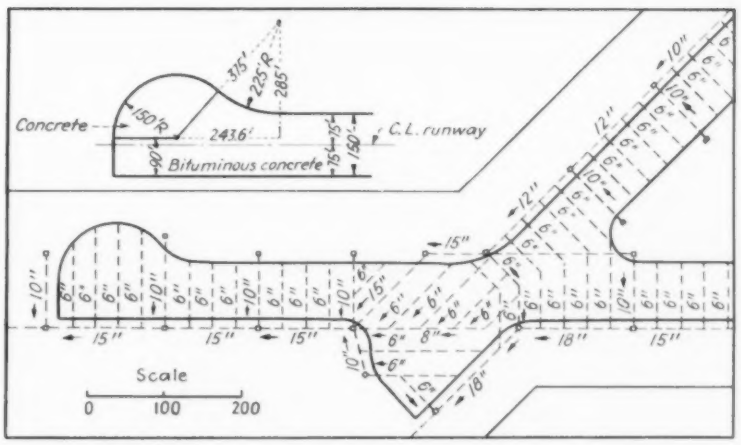
AIRPORT LAYOUT in vicinity of hangar and administration building indicates certain features of lighting system, in addition to runways, taxiways and concrete turnarounds. Dimensions and radii of turnarounds are shown in insert in accompanying plan of drainage grid. Revolving airport beacon is placed on roof of hangar.

A TABLE-TOP AIRFIELD with four 150-ft. runways 3,600 to 3,850 ft. long on which a plane can land from any direction is taking shape on a plateau between the Mahoning River and Lake Erie in northeastern Ohio, where the city of Youngstown, with the aid of WPA, is transforming a 600-acre site, high above valley fogs, into a modern airport distinguished by complete drainage of clay subgrade and by slag bases and slag asphalt surfaces for the runways. To trap all subgrade water and to intercept any infiltration from the high groundwater table at the site, the runways are designed with porous edge drains and transverse tile drains on 60-ft. centers, backfilled with slag. Compacted slag base 8 in. thick, weighing 127 lb. per cubic foot, is laid on an insulation course of slag fines to provide a sturdy foundation for a 2-in. asphaltic concrete surface; both the slag base and the bituminous surface are placed in two courses.

Situated on high ground almost 300 ft. above the city's business section, which lies 13 mi. by road, or 20 min. by automobile, south of the site, Youngstown's first airport offers the nearest possible approach to an all-weather airfield. To the eyes of a flying pilot, the airport will present four broad strips of black runway set in a field of green, with the ends of the runways marked by turnarounds of light gray concrete. Three commercial airlines already have contracted to use the airport, which will be complete with runways and buildings this fall.

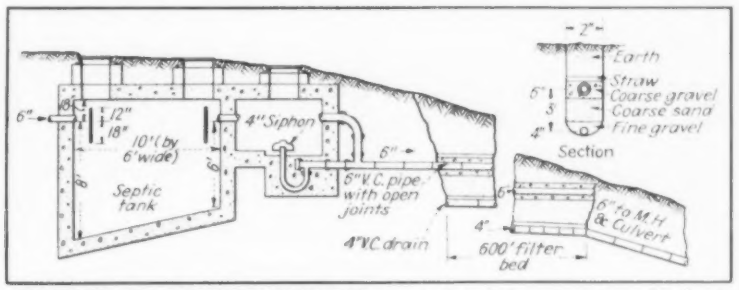
Designs and specifications for the airport were prepared by the engineering department of the city of Youngstown. In this work the experience gained by the Work Projects Administration in the construction of more than 1,400 proj-

CITY-OWNED EQUIPMENT consisting of ¾-yd. power shovel and 2-yd. trucks move material out of grading cut for northwest-southeast runway



DRAINAGE GRID incorporates transverse slag-filled pipe underdrains on 60-ft. centers emptying into pipe drain under ditch at lower side of runway. On upper side of runway, surface drainage is trapped by drop inlets on ditch line. Slag-filled edge drains are not shown on this plan.

RUNWAY FILL is compacted in 6-in. layers by tractor-drawn dual sheepsfoot rollers. To save turning and backing in widening fill, truck drives straight ahead over edge of embankment before dumping.



PROBLEM OF SEWAGE DISPOSAL in isolated location is solved at Youngstown municipal airport by simple system comprising septic tank and 600-ft. filter bed fed by 4-in. flushing siphon.

ects involving 656 airports and landing fields proved of valuable assistance to the designers.

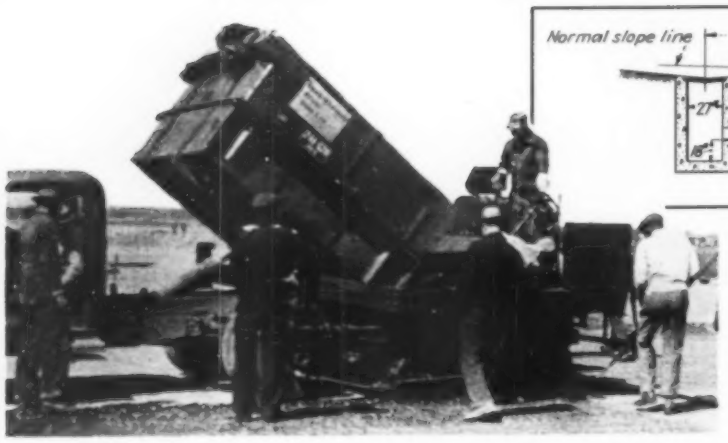
Grading Site — Despite the favorable topographic location of the rectangular 595-acre plot on which the airport is being constructed, a total of 1,000,000 cu.yd. of earth must be moved to grade the site. The maximum cut is about 10 ft., and the maximum fill is about 4½ ft. Cuts and fills nearly balance; only about 5,000 cu.yd. will be wasted by feathering out the fills. Ahead of the excavators, the construction force prepared the site by wrecking 23 farm and roadside buildings and by taking out a large number of trees, more than 5,000 of which were of diameters greater than 12 in.

Excavation is being handled by four power shovels, two rented Lorains of 1¼-yd. capacity and two city-owned shovels, a P&H and a Byers, of ¾-yd. capacity. In addition, the city contracted in June for three Galion Cyclone 15-yd. self-loading scrapers, rented from the M. DeBartolo Construction

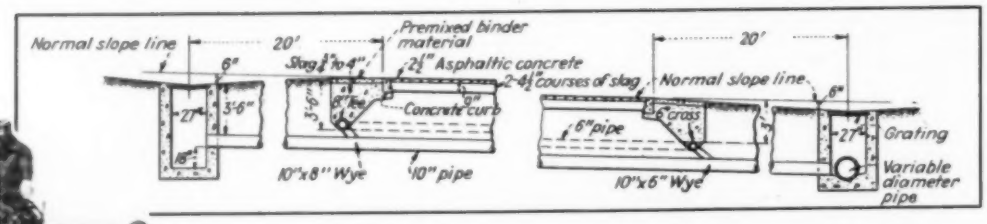
SLAG FORK with tines spaced ¾ in. apart separate ungraded slag into fine and coarse sizes for base construction.

INSULATION COURSE about 1½ in. thick of fine slag is hand-tamped into subgrade to prevent clay from working up into base.

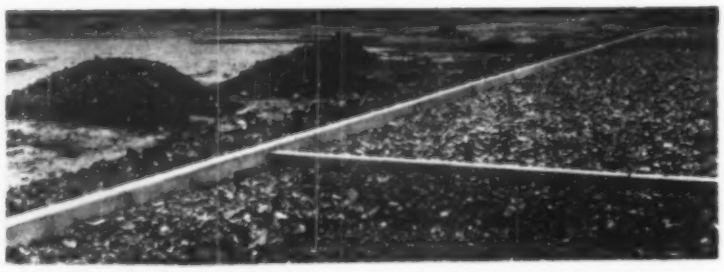
FIRST 4-IN. COURSE of larger slag is spread on tamped insulation mats, oversize fragments being napped to 4-in. maximum size. Slag hook is used for leveling 4-in. course.



BLACK TOP PAVER spreads cold-mixed asphaltic concrete in 10-ft. lanes for each of two 1-in. courses of runway pavement.

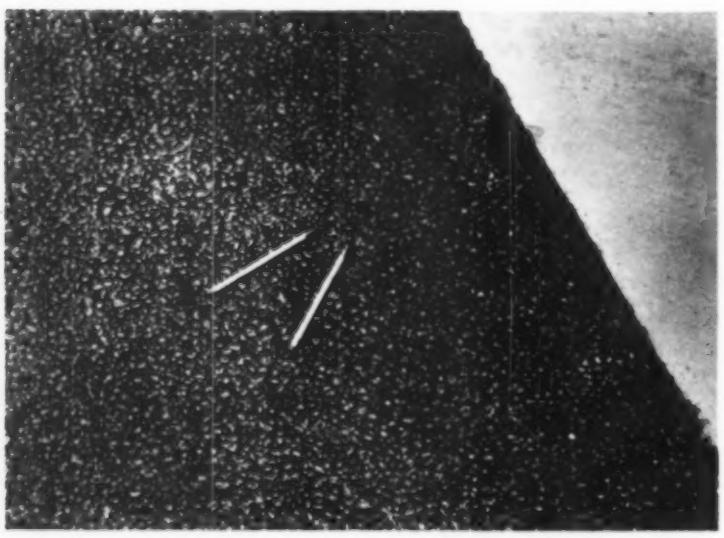


TYPICAL RUNWAY SECTION shows 10-in. transverse drain connecting with drop inlet on upper ditch line. Transverse 10-in. drains on 300-ft. centers are connected with runway edge drains and with intermediate 6-in. transverse drains, located on 60-ft. centers. All transverse runway drainage trenches are backfilled with coarse slag.



TRANSVERSE CONCRETE HEADERS are constructed to grade of slag base at about 400-ft. intervals to confine base material and to facilitate paving.

SELF-POWERED 15-YD. SCRAPERS equipped with six-cylinder 100-hp. diesel engines have eight forward speeds (1 to 25 m.p.h.) and two reverse. Scrapers are built to shuttle on short hauls or turn on 15-ft. radius on long hauls. Use of pusher tractor decreases loading time and increases yardage.



GRANULAR TEXTURE of asphaltic concrete surface is indicated by comparison with two pencils laid on pavement near edge of turnaround.

Co., Youngstown, to expedite grading. Tractors in operation at the airport include a Caterpillar 96-hp. diesel with bulldozer, two Allis-Chalmers 60-hp. track-type gasoline units equipped with Baker bulldozers, two Allis-Chalmers 50-hp. gasoline tractors, one International 30-hp. pneumatic-tired wheel-type, and two old Bests, a 30-hp. used for dragging and a 15-hp. for hauling two water wagons, one of 1,200-gal. and the other of 800-gal. capacity. A Galion road patrol works on hauling roads, access roads and runway subgrade.

For hauling, the project utilizes 37 trucks of average 2-yd. capacity. The city owns 27 of the trucks, of which 14 were purchased new for this project — 5 Chevrolet, 5 Ford, and 4 GMC. Among the remaining 13 city-owned trucks, Internationals and Dodges predominate.

Fills are compacted in 6-in. layers by a tractor-drawn Bros sheepsfoot roller.

Subgrade Drainage — A clay soil subgrade and a high groundwater table, indicated by free water encountered at 24-in. depth in some trenches, makes adequate artificial drainage of primary importance for sound construction of runways. The designers met this problem by a complete grid drainage system comprising 22 mi. of pipe in 6-in. to 24-in. diameters. An accompanying part

(Continued on page 109)

OPERATIONS AT SITE are directed for WPA by E. S. TURNER, project supervisor.

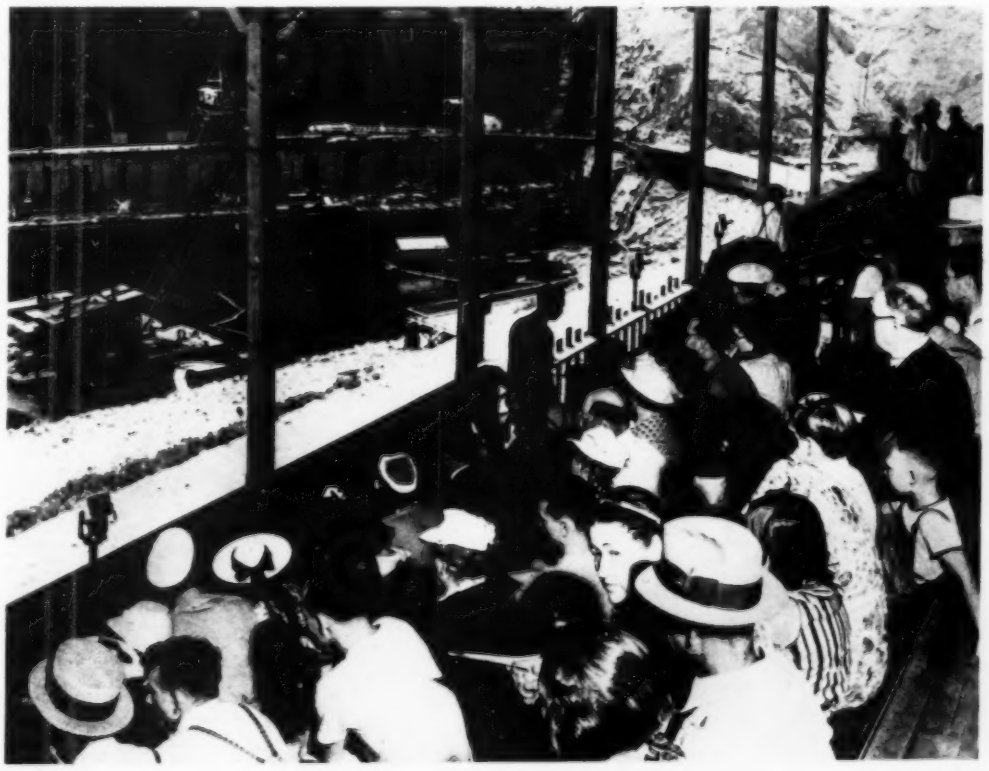
AIRPORT CONSTRUCTION is directed for City of Youngstown by James J. Smith, construction engineer.

TANDEM ROLLERS filled with water to give 10-ton weight compact binder course and wearing course of asphaltic concrete pavement. Roller is ready to move off portland cement concrete turnaround at one end of runway.

JOB oddities

BUCKING BRONCHO TECHNIQUE characterizes performance of this Le Tourneau tractor-operated rooter when it dislodges large rock in clearing and grading site for new LeTourneau factory at Toccoa, Ga., which will provide a manufacturing area of 160,000 sq.ft. for company's heavy-duty carryall scrapers and other types of earth-moving equipment.

GIANT INNER TUBE from Firestone earth-mover tire, designed for use on large-capacity carryall scrapers, supports entire swimming team of 12 girls at Akron, Ohio. Tire stands nearly 9 ft. high and is employed on earth-moving equipment for grading airports, constructing earth dams and building highways.



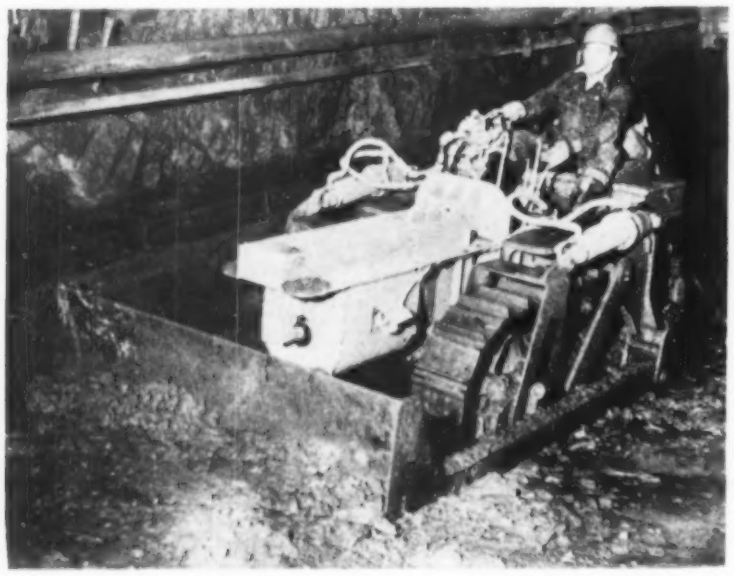
CONSTRUCTION KIBITZERS at Grand Coulee dam, U. S. Bureau of Reclamation project on Columbia River in Washington, are provided with de luxe accommodations in the form of grandstand from which concreting operations of Consolidated Builders, Inc., can be viewed in comfort. Guide, speaking into amplifier system, explains features of construction interest.

SNARL OF CONCRETE AND STEEL, produced by demolition of building in Pittsburg area, is readily handled by ½-yd. Blaw-Knox hard-digging bucket, operated from Universal truck-crane by R. J. Omslaer Wrecking Co.

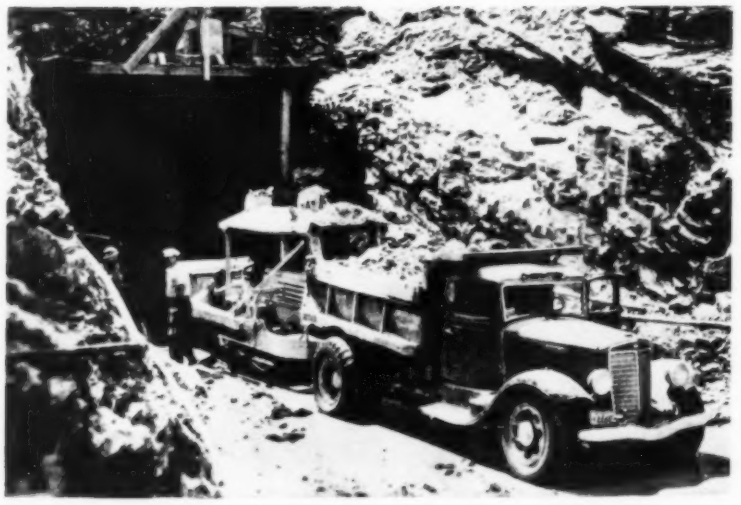
How They Did It

CONSTRUCTION DETAILS For Superintendents and Foremen

SPREADS AND TAMPS in one operation. Equipped with McCaffrey bull dozer blade and set of made-to-order sheepsfoot tampers securely attached to track plates this International T-20 tractor of R. W. Hampton Co., contractor, distributed, leveled and compacted earth foundation for basement floor of May Co. department store in Beverly Hills, Calif.



ELECTRIC-POWERED BULLDOZER RIG is employed by Associated Contractors, Inc., for cleaning up muck on invert of section of Delaware aqueduct tunnel for New York City's water supply. To avoid exhaust fumes from internal combustion engine, contractor substituted 25-hp. squirrel-cage electric motor for standard power unit of Caterpillar tractor. The electric tractor-bulldozer outfit is used to pile up loose tunnel muck for loading by Conway mucking machine, thus avoiding high cost of hand labor for this operation.



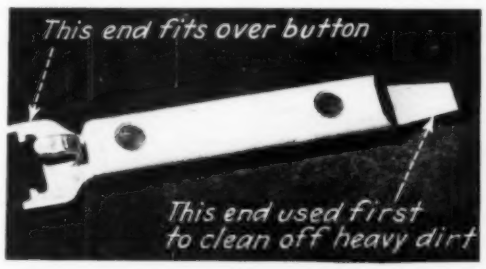
TO AVOID DANGER OF CARBON MONOXIDE fumes from exhaust of gasoline-powered truck in tunnel at Indian Rock dam near York, Pa., haulage of muck is handled by Cletrac tractor, powered by Hercules diesel engine, which tows empty truck into tunnel and pushes it out of bore when loaded with blasted rock by Sargent overhead shovel attachment on tractor. Contractor in U. S. Engineer Department project is Benjamin Foster Co., of Philadelphia. When loaded truck emerges from tunnel, it proceeds to dump under its own gasoline power.

CONCRETE GUNS LINE railroad relocation tunnels at Shasta dam in California. United Concrete Pipe Corp., contractor, of Los Angeles, uses pair of 1-cu.yd. Presweld concrete guns mounted side by side for alternate delivery to maintain constant flow of concrete into tunnel lining forms. Forms were in 50-ft. lengths and, according to overbreak, required 265 to 280 cu.yd. of concrete each. Guns discharged in 20 sec. and completed 50-ft. pour in 5½ to 6 hr., rate of about 50 cu.yd. per hour.

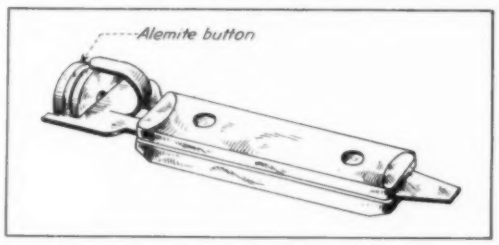
HANDY HOIST RIG delivers roofing material, in form of bundles of clay tile, for J. W. Bender Roofing and Paving Co. of San Francisco on Sunnydale mass housing project. Rig consists of framework of standard pipe cut to fit roof slope and fastened back to counterbalance projection beyond eaves, permitting direct lift from ground level. Power is supplied by gas engine and small hoist. Rig permits load to be rolled inboard to convenient landing space.

AUTOMATIC PIPE ANTICIPATOR, dubbed "seeing eye of excavation," consists of signal device designed to forewarn excavator operator by audible signal as his bucket approaches hidden underground service pipes or cables. Attached to any type of excavator Wallace & Tiernan device produces continuous sound which operator hears either through loudspeaker or ear phones. As bucket approaches pipe or cable obstruction, sound volume increases, enabling operator, after brief experience, to dig within few inches of hidden pipes or cables without damaging them.

TO FACILITATE TRANSFER of concrete paving equipment from one lane to next on Pennsylvania Turnpike, Adam Eidemiller, Greensburg, Pa., contractor, utilizes tractor-drawn sled to transport units traveling on steel forms from one lane and turn them into reverse position to operate on parallel lane, with loss of 33 min. in paving operations as compared with 3 to 4 hr. consumed by other methods. While longitudinal finisher is completing concrete run in one lane, sled has transferred subgrader, spreader and two transverse-screed finishing machines to parallel lane. Tractor and sled are waiting for longitudinal finisher, and paving operations are moving away on second lane. — Photos from Sam H. Showell, engineer, Adam Eidemiller, Greensburg, Pa.



TO CLEAN GREASE BUTTONS of Alemite fittings prior to lubrication of equipment, RICHARD EICHACKER, R. D. 1, Portland, Conn., invents this useful tool **(above and below).** Cleaning end is outline of cross-section of button. One complete turn with tool cleans button.



ABSORPTIVE FORM LINER, consisting of panels of new Celotex product, is applied to inner surfaces of forms to produce harder, denser and smoother concrete. Liner is claimed to remove excess water from concrete in contact with form and to absorb air bubbles from surface, eliminating pitting and sand streaks. These form liners are being used on concrete dams of U. S. Bureau of Reclamation and Tennessee Valley Authority. They produce structural change in concrete to depth of 1½ in. back from face of form.

PUSHING TEAMWORK is accomplished by these five Allis-Chalmers tractors, converted to burn butane fuel, on road-grading job of J. A. Carlson, contractor, of Omaha, Neb. Operating Gar Wood scrapers tractors line up to push each other in order to reduce loading time.

Mass Production Methods

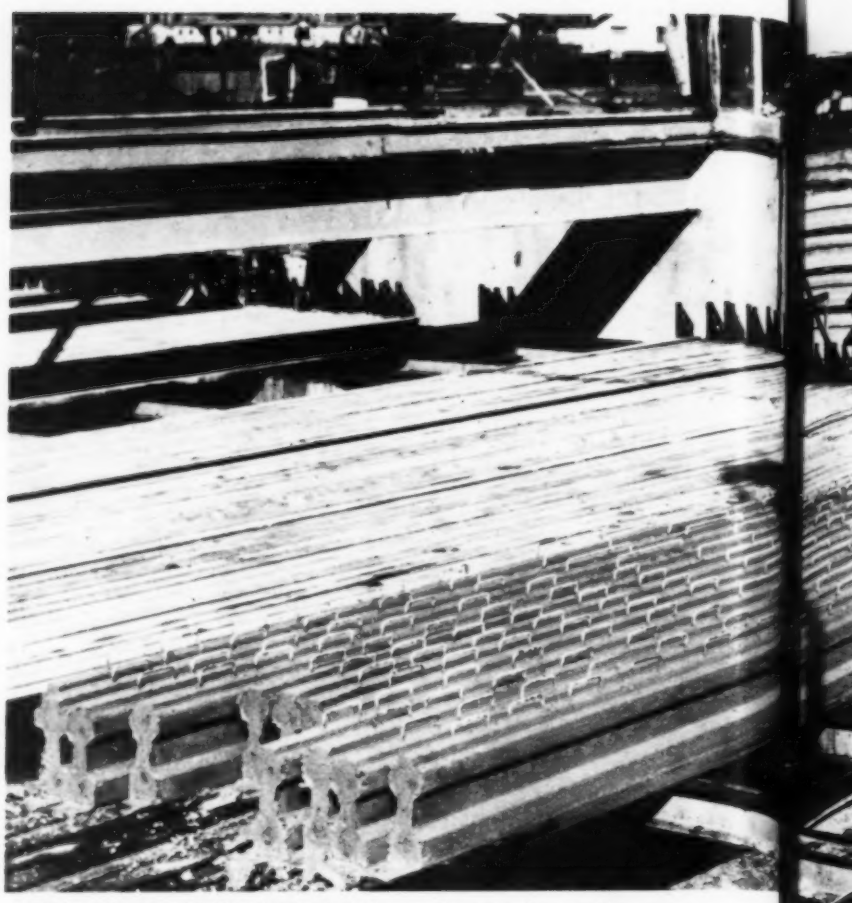
Cut Costs of 88 Concrete Units In California Housing Project

ON THE CARMELITOS HOUSING PROJECT in north Long Beach, Calif., $2,300,000 is being spent for the construction of 607 family dwelling units for rental to families whose income is less than $1,000 per year. Modern methods and equipment, plus a special set-up for mass production, have made it possible to keep construction costs of these concrete buildings down to a level comparable with that of ordinary wood-frame dwellings. The project is based on the requirements that the one- and two-story buildings, of which there are 88, will be serviceable for a 60-year period. This long-life expectancy had much to do with the selection of materials and the design of the structures.

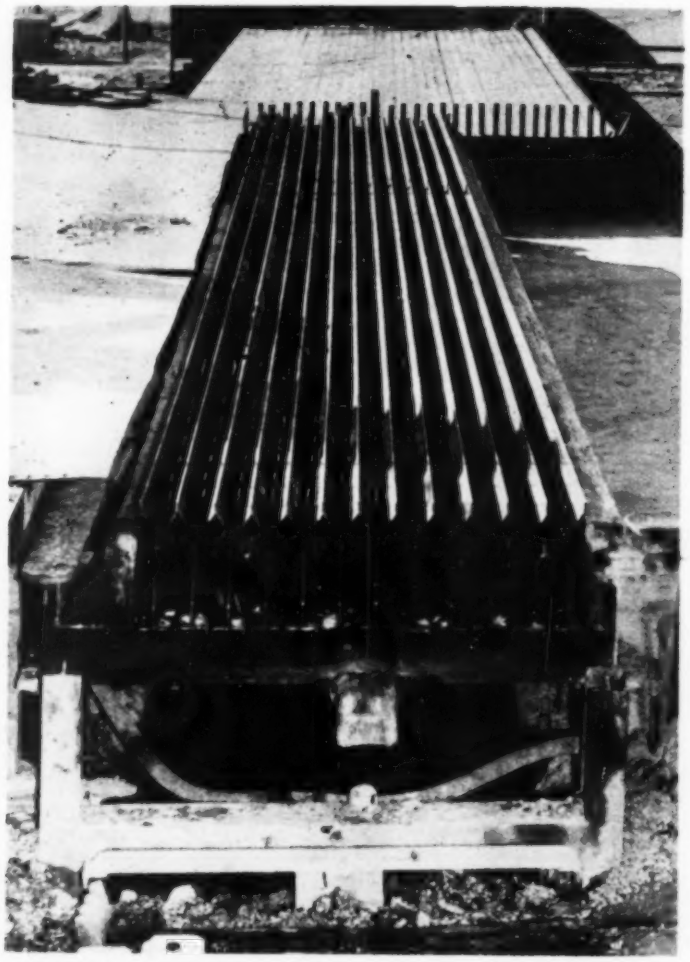
Particularly noteworthy are the precast concrete floor joists, designed with a shoulder to support "wrinkled" 26-gage metal forms for the underside of the floor slabs. These forms are not removed after the floor is poured, thus saving time and avoiding the leaving of wood under the house where it would constitute a termite menace.

Metal wall forms were so designed that a minimum of work is required in the concrete openings preparatory to placing frames for doors and windows. Only copper tubing is used for all water pipes of 2-in. diameter and less. Stairways are made of precast concrete units. The 6-in. concrete walls constitute their own interior and exterior surfacing and a roofing of flat clay tile finishes off the structures. The only major item in the structures for which wood is utilized is the roof trusses. These are precut and bolted together as illustrated in a series of photographs on p. 68. The wood is chemically treated to give it protection for a long life.

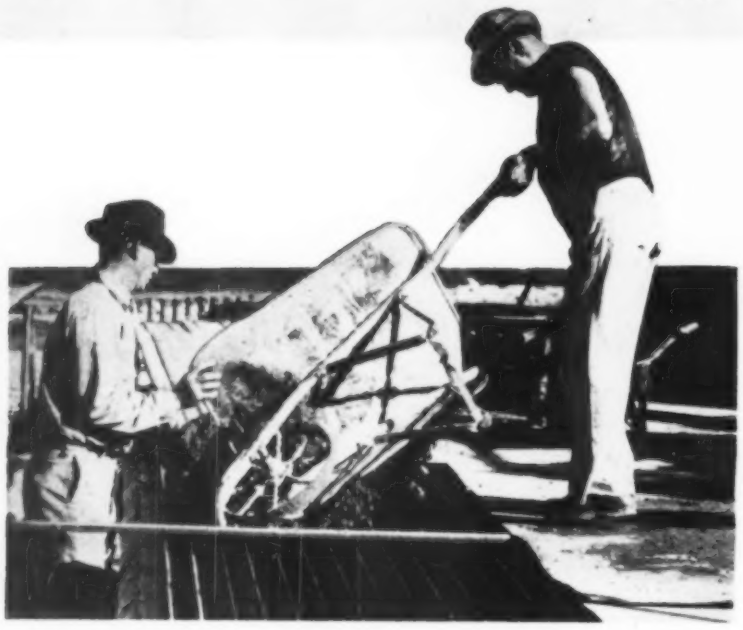
Plans were drawn and construction is being supervised by the Associated Housing Architects; Cecil A. Schilling and Kenneth S. Wing, architects, C. Arthur Schilling, engineer, and Clarence S. Stein, consultant. The George A. Fuller Co. holds the general contract on the job and the Fabriform Co., under the direction of Fred Bagaman, is carrying out the contract for the "wrinkled" forms, floor slabs, and precast concrete floor joists, stairs and window sills. The Carmelitos project is one of several to be built under supervision of the Los Angeles County Housing Authority; Melville Dozier, executive director and John Stearns, assistant executive director. J. H. Davies is structural engineer for the housing authority on the Carmelitos job.



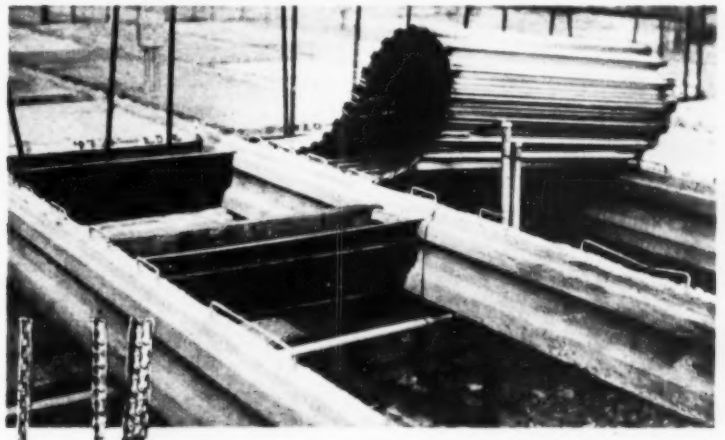
JOISTS, AFTER BEING EXTRUDED from vibrating form table, are coated with sealing compound. Joists and racks supporting them will then be rolled forward. Note protruding reinforcing rods later used to support reinforcing in floor slabs of houses.

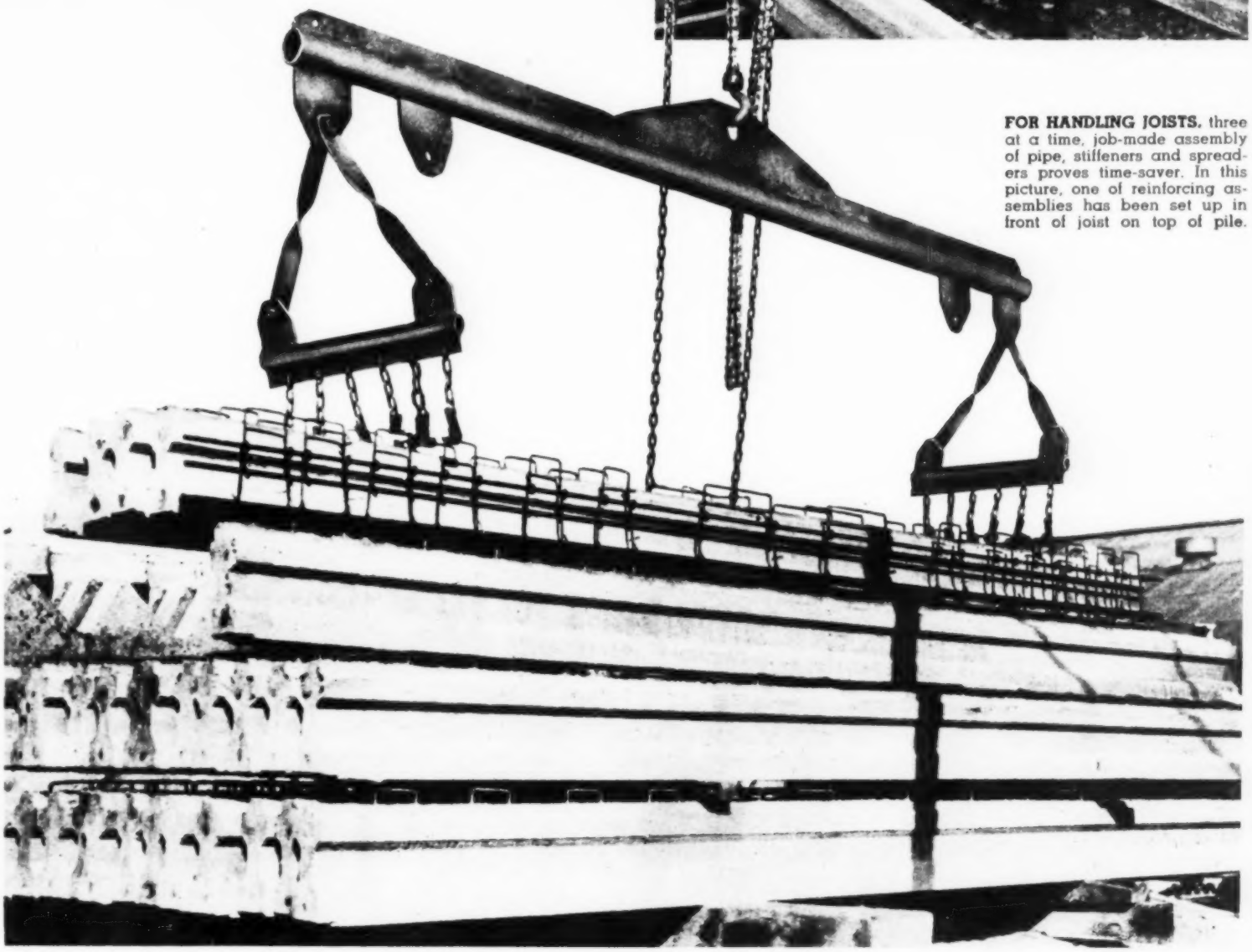


FLOOR JOIST FORMS assembled on vibrating platform, with reinforcing in place ready for pouring. Concrete **(left)** comes over deck at left. After being cast, joists are extruded and slid forward to curing table in background.

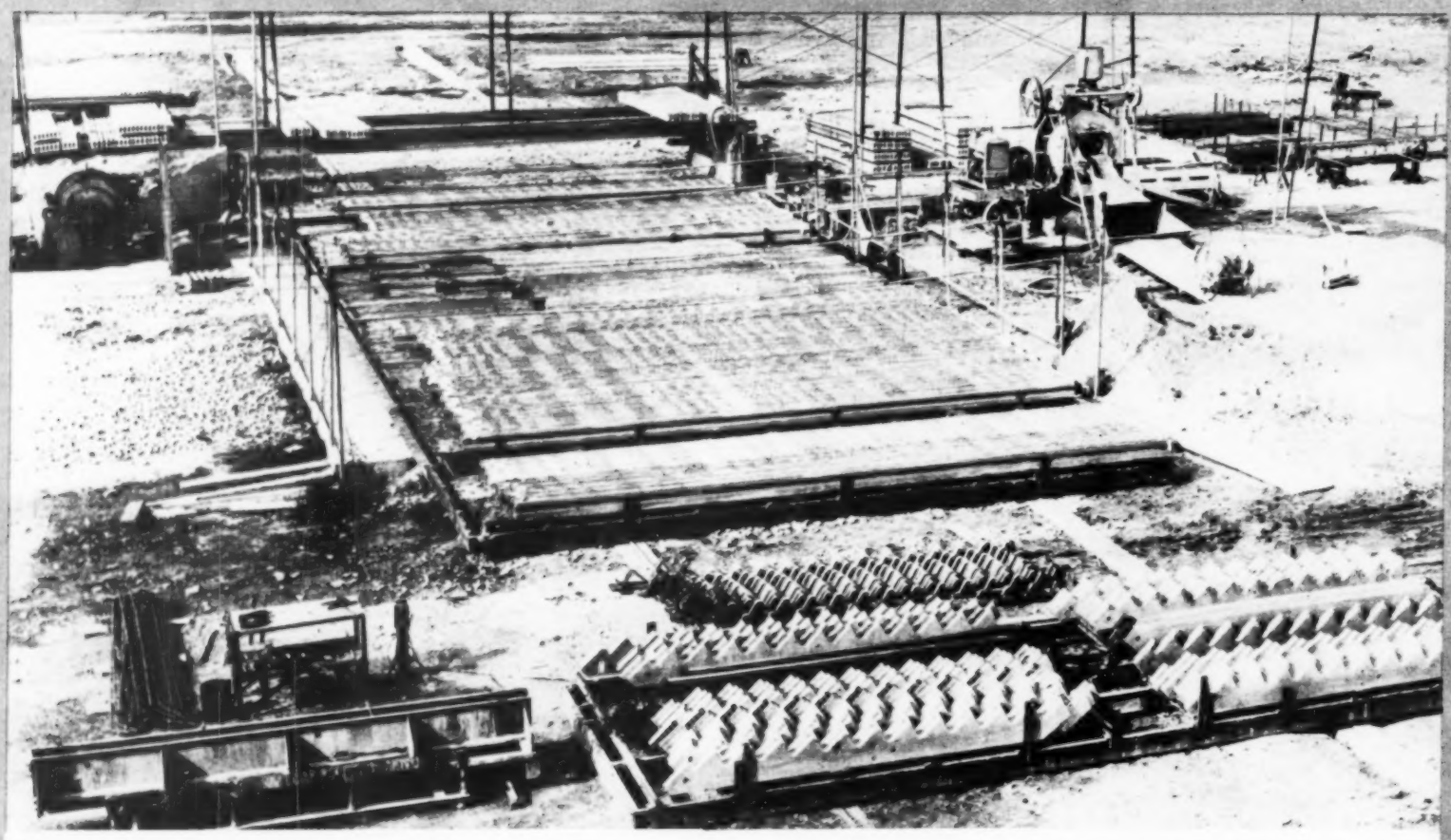


FLOOR FORMS are placed by workmen who carry them to desired location **(above)** and merely rest edges upon shoulders left in precast concrete joists for this purpose. Where necessary, floor forms can be rolled back **(below)** while work is done on "roughing in" utilities.

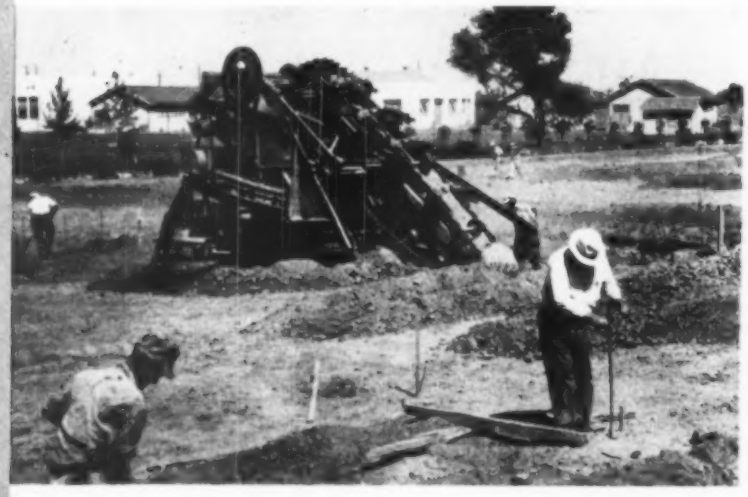




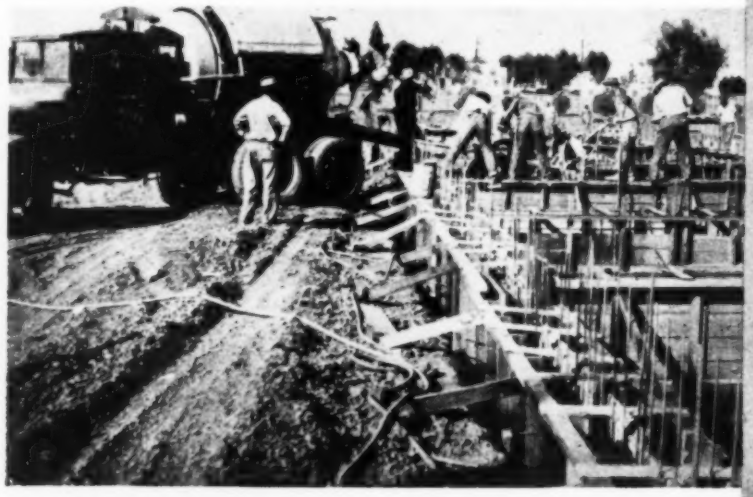
FOR HANDLING JOISTS, three at a time, job-made assembly of pipe, stiffeners and spreaders proves time-saver. In this picture, one of reinforcing assemblies has been set up in front of joist on top of pile.



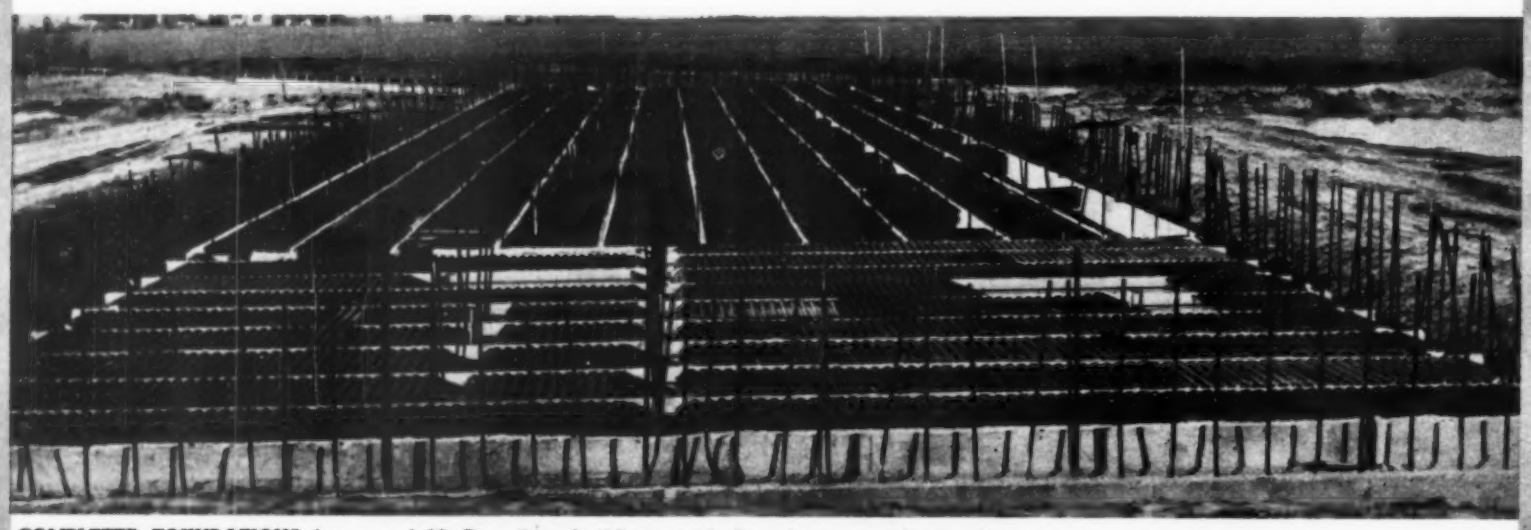
CASTING AND CURING YARD, showing precast stair stringers in foreground, curing yard for precast joists beyond and, at right center, concrete mixing plant. Behind mixer is vibrating table for casting joists.



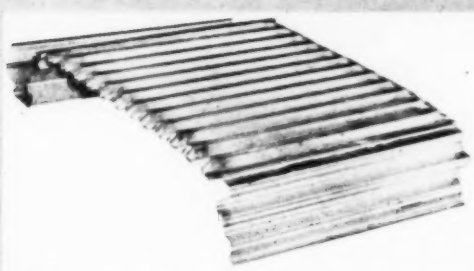
EXCAVATION for concrete foundations is made largely with 18- and 24-in. trenching machines.



READY-MIXED CONCRETE is trucked to job for foundations, which are formed in usual manner.



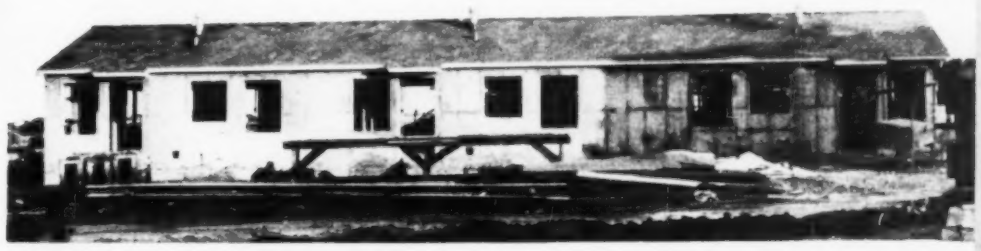
COMPLETED FOUNDATIONS for one of 88 Carmelitos buildings, with floor forms partially in place.



NEW TYPE OF FORM for under side of concrete slab was manufactured for this job. It consists of "wrinkled" 26-gage metal and is left in place after pouring. This material not only has adequate strength to support loads incidental to construction, but it is easily bent into curves.

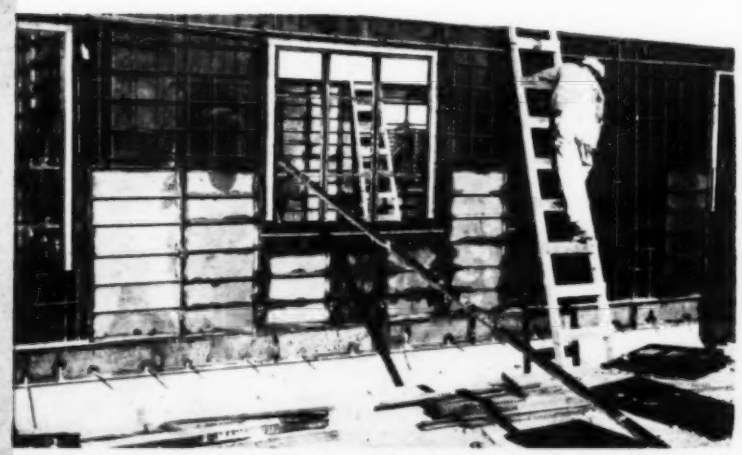
CONCRETE FLOOR SLAB is poured from chute on to metal forms.

PRECAST CONCRETE STAIR STRINGERS are bolted to concrete walls, and pair is held together by bolts through spacers.

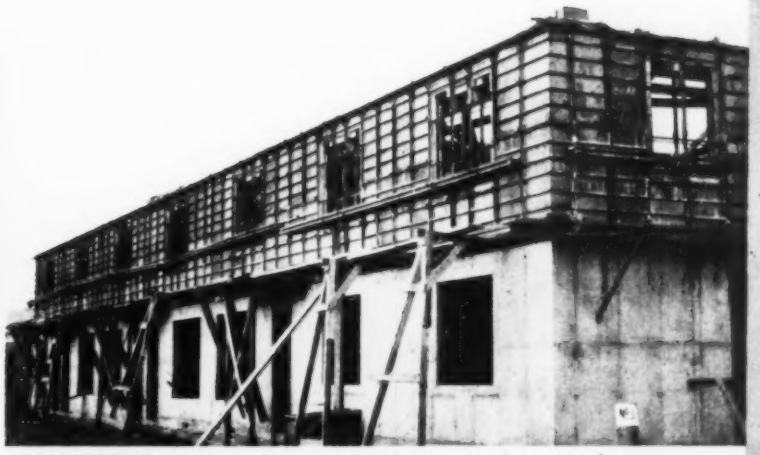


BOTH ONE- AND TWO-STORY buildings are included in project. Roofing consists of flat tile known as "clay shingles".

FOR SECOND STORY POURS (right), temporary shoring and first-story walls provide necessary support.



WALL FORMS are bolted into place in foundation concrete and, after being trued up, are held with wood braces. Special arrangement of steel at openings makes it possible to complete in initial pour much of the work ordinarily done by hand later on.



WALL FORMS in place for pouring of concrete for second story.

Tough Going!

A COMPLETE LINE OF HEIL HYDRAULIC TRAILBUILDERS AND BULLDOZERS WITH FR

...BUT NOT FOR A CLETRAC AND HEIL TRAILBUILDER UNIT!

"For the past few months I have been operating a Heil Trailbuilder and a Model DD 61 H. P. Cletrac Tractor. I find this trailbuilder and tractor holding up under one of the toughest road conditions, moving large rocks and tree stumps."

Very truly yours,

(Signed) CHARLES J. SMITH, Stroudsburg, Pa.

Many a Mr. Smith will tell you the same story—a story of the ability of Cletracs to do the work as it should be done with a low maintenance and operating cost. Cletrac's **Controlled Differential Steering** gives positive control in bulldozing over fills, working up or down hills or on any job where safety as well as performance is a factor.

Without a high reverse speed, time is lost in bulldozing—but then there are times when a low reverse speed is necessary. Cletracs have both—a low speed where required and an all-important high speed to eliminate that costly loss of time in "backing up" without load on bulldozing, trailbuilding or shovel operations. The high reverse speed, *Standard in Cletracs**, reduces lost "back up" time, increases productive working time and the number of dollars you earn.

Let your nearest Cletrac dealer show you on your job how Cletracs will do your work with a lower maintenance and operating cost.

●

Left: Mr. Charles J. Smith operating a Model DD 61 H.P. Cletrac Diesel Tractor equipped with a Heil Trailbuilder at work on a WPA Project in Delaware Water Gap, Pennsylvania, called River Road.

A complete line of Cletrac Crawler Tractors for all industrial work—27 to 97 drawbar horsepower—Gasoline and Diesel.

**Models B, D and F.*

Cletrac
Crawler Tractors
REG. U.S. PAT. OFF.

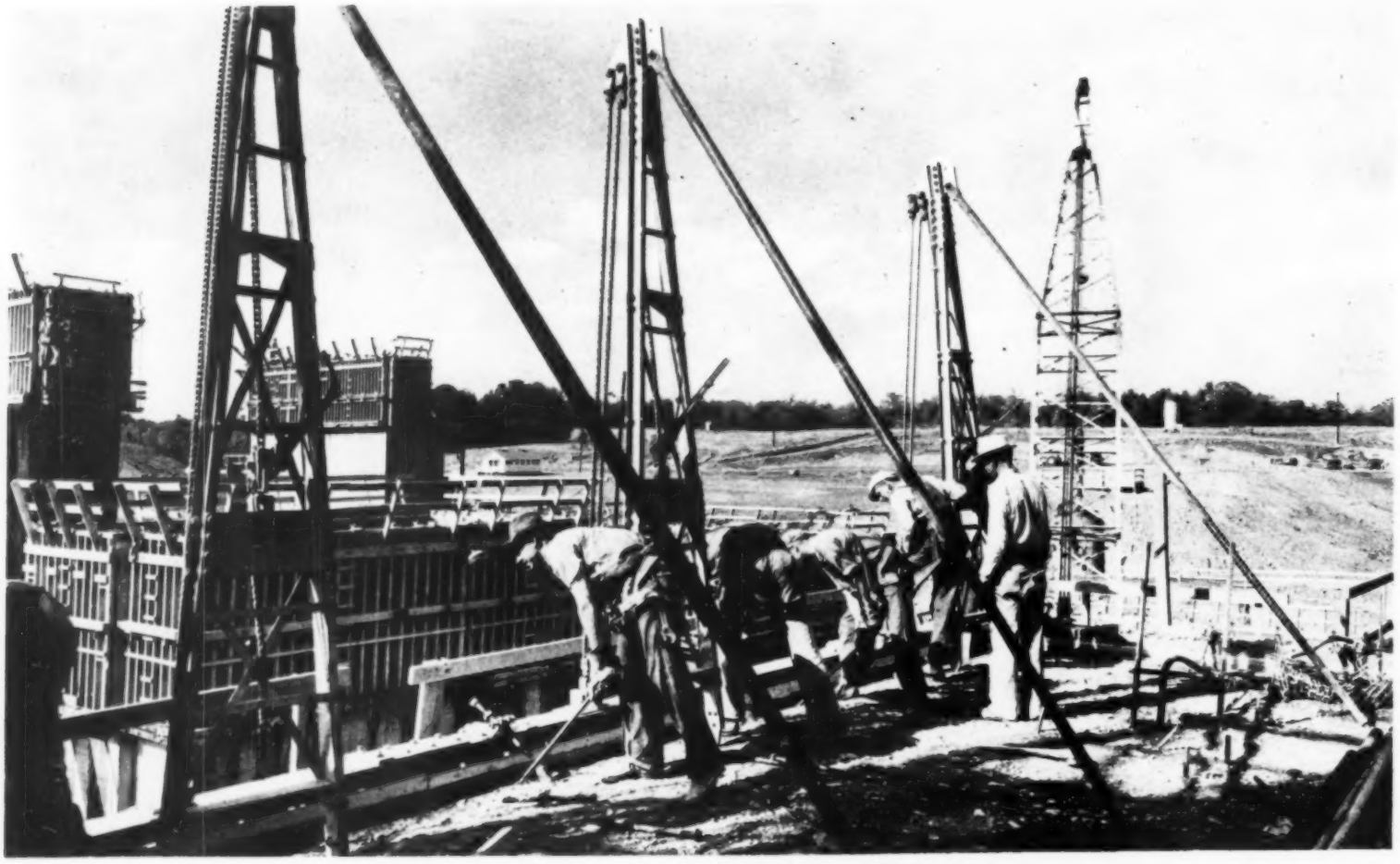
Brief Specifications of Cletrac DD
Also available in Hillside model

Weight approx. with standard grousers	13,700 lbs.
Hillside Model	14,200 lbs.
Weight equipped with Heil Trailbuilder	17,700 lbs.
Hillside Model	18,700 lbs.
Speeds Forward—1.7; 2.3; 3.1 and 4.9 M.P.H.	
Speeds Reverse—2 and 3.65 M.P.H.	
Drawbar H.P.	61.19
Belt H.P.	67.71

CLEVELAND TRACTOR CO.

CLEVELAND, OHIO

FRONT OR REAR MOUNTED PUMPS AVAILABLE FOR CLETRACS FROM 27 TO 97 H.



COSTS IN MAN-HOURS AND IN MONEY on each of several steps which make up complete operation are essential to full study of complete item such as Panel Form Costs.

Wood Panel Forms FOR BUILDING CONCRETE DAMS

Part IV

Fourth of a Series of Articles Dealing with Form Design, Manufacture, Handling and Cost-Keeping Methods

By H. P. MAXTON
General Cost Engineer,
Tennessee Valley Authority
Knoxville, Tenn.

TIME STUDIES serve to provide valuable information, not otherwise obtainable, on certain phases of construction work.

Before beginning any time study, those interested should discuss the scope of the study, its justification and the results expected. It must be borne in mind that, in making studies of this kind, the entire time of one or two men on each shift usually is required for a period extending from several days to several weeks, and efficiency dictates that such studies shall be undertaken only when the information desired is obtainable in no other manner. Time studies have been extremely effective in reducing industrial plant operating costs, but it does not necessarily follow that they will be equally effective on construction operations. However, if time studies are intelligently chosen and carefully planned and executed, unusually interesting and valuable data will be obtained.

This outline has been prepared for the purpose of calling attention to the various factors to be considered in planning and making time studies and to the method of reporting the results obtained.

Reasons for Making Time Studies

Consideration usually will be given to a plan for making time studies for one of the following reasons:

(1) To compare various methods of performing certain items of work.
(2) To compare the efficiency of shifts, foremen and workmen.
(3) To compare the operating efficiency of different types of equipment on a basis of production and operation cost.
(4) To make a complete analysis of all elements entering into the labor cost of an item.
(5) To make a correct determination of the reasons for variations in labor costs of what appear to be similar operations.
(6) To study possible methods of reducing construction costs.
(7) To obtain special information of various kinds not obtainable through the usual labor distribution channels.
(8) To develop a spirit of competition between gangs or between shifts doing the same class of work.

Value of Time Studies

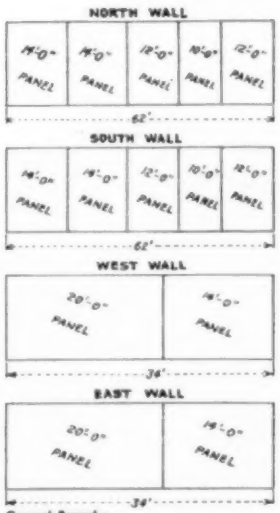
Time studies for construction projects usually are most valuable on those items which continue over a long period and on which the several items entering into a completed whole are at different stages of completion. Form costs are a good example. Shop fabrication may be several months in advance of erection and may be in progress intermittently or

TENNESSEE VALLEY AUTHORITY
WATTS BAR DAM

MATERIALS LIST

Block No. B-14 Lift Elev. 663.0-673.0 Shift 7-3:45 Temp. 60 Date 4/3/40

Observer John Doe



MATERIALS ITEMS	North	East	South	West	Total
PIPE FORM BRACES	10	7	10	7	34
HANGER BOLTS	10	7	10	7	34
STUD BOLTS ASSEMBLIES	16	10	16	12	54
ANCHOR BOLTS	10	7	10	7	34
EXTRA ANCHOR-RODS				8	8
EXTRA TYCOIL ASSEMBLIES				8	8
1"ø TIERODS TYCOIL-EACH END				8	8
CHANFER STRIP					80'0"
GRADE STRIP					192'0

General Remarks:

Contact area For lift = 1920 sq. Ft.

No field fabricated forms erected. No lumber other than chamfer and grade strips in lift.

Extra bracing placed on west wall. (See print for type of lift making this necessary.) Block completed at 3:45 P.M. 4/3/40

SPECIAL FORM for listing materials is filled out and turned in by field time study men with daily report. Information given by materials report is important in figuring costs.

TVA 1320
TENNESSEE VALLEY AUTHORITY **TIME STUDIES**

DAILY FIELD REPORT SHEET 1 OF 6

SUBJECT Erection Panel Forms PROJECT Watts Bar Dam
WEATHER Cloudy, Temp. 60° NO. OF MEN Foreman--11 BLOCK NO. B-14
OBSERVER John Doe DATE 4/3/40 SHIFT 7:00-3:45 ELEV. 663.0-673.0

DESCRIPTION OF WORK	BADGE NO.	START	END	TOTAL TIME	HR. RATE	COST
Mr. R. Grant (Foreman)	1040	7:00	11:00	240'	1.375	$5.50
Placing pipe form braces, aligning and bracing panels	2556	7:00	9:30	150'	1.125	
" " "	2557	"	"	150'	"	
" " "	2549	7:00	9:00	120'	"	
" " "	2430	"	"	120'	"	
Checking points and placing lines	2444	7:00	8:30	90	1.125	
Measuring for pipe form braces	3033	"	"	90	.95	
Wrecking out section of screed form	2559	7:00	8:00	60	1.125	
Placing form filler on west side lift	2559	8:00	9:30	90	1.125	
Cutting off end of lagging to match up panels	2444	8:30	9:30	60	1.125	
	3033	8:30	9:30	60	.95	
Building scaffold to work from in aligning and bracing panels	2558	7:00	8:00	60	1.125	
Placing grade strips in position, Elev. 673.0	2549	9:00	10:00	60	1.125	
" " "	2430	9:00	10:00	60	"	
" " "	2556	9:30	10:00	30	"	
" " "	2557	9:30	10:15	45	"	
" " "	2444	9:30	10:15	45	"	
" " "	3033	9:30	10:15	45	.95	
Drilling holes and placing bottom tierods on west wall	2556	7:00	8:45	105	1.125	
	2554	7:00	8:45	105	"	
Placing stud bolt assemblies	2549	10:00	11:00	60	1.125	
	2430	10:00	11:00	60	"	
Wrecking out tunnel forms (Intake)	2559	9:30	10:00	30	1.125	
Placing form fillers and plugging up 1-in. drill holes, all panels	2556	10:00	11:00	60	1.125	
	2557	10:15	11:00	45	"	
Placing chamfer strips in position	2444	10:15	11:00	45	1.125	
	3033	10:15	11:00	45	.95	
Building screed section (Form)	2559	10:00	11:00	60	1.125	
	2558	8:00	11:00	180	"	

BASIC TIME STUDY DATA are noted by observer on daily field report. As this report is source of all time study information, it must be reconciled daily with foremen's time cards and with quantity estimates.

for only a short period of time. Form erection extends continuously over a long period at various locations. Form stripping often is considerably behind erection. Under these conditions, it is difficult to determine accurately, from unit costs alone, the effect that varying conditions and localities have on completed form costs. Man-hour studies and item time studies then are very revealing.

Planning Time Studies

Time studies should be carefully planned in advance, the purpose for which they are made being thoroughly discussed with all persons interested and the scope of the work being clearly defined to make the studies broad enough to include all necessary operations without involving unnecessary details. The views of the construction superintendent are important to determining the scope of the investigation.

Time Study Men

At this point the selection of the men to do the work should receive careful attention. Men chosen to make time studies should have the ability to gain and hold the respect of the persons with whom they come in contact. Broad experience on the work to be studied is invaluable.

Conduct of the field parties making the survey is of the greatest importance if maximum results are to be obtained. Field men making time studies should realize the full responsibility of their position and conduct themselves with dignity while on the job. They must be extremely careful not to retard in any manner the progress of the workmen.

If time studies are to be of value, it is necessary to obtain the full cooperation of the entire construction forces. The

(Continued on page 90)

TENNESSEE VALLEY AUTHORITY SHEET 1 OF 3

SUBJECT Erection Panel Forms PROJECT Watts Bar Dam
Field Notes
COMPUTED BY John Doe DATE 4/3/40 CHECKED BY DATE

Erection operation in progress at 7:00 A.M. Foreman with eight men and three helpers.

All necessary materials in lift such as pipe rods, stud bolts, chamfer and grade strips, Tyloop coils, hanger bolts and miscellaneous small items: nails, lumber, etc.

All conditions were such that crew began operations on 100% efficiency basis.

All panels in good condition for aligning and bracing. Will not be necessary to order any special length pipe tierods.

Holes for stud bolt assemblies in proper location.

Eight of the adjustable panel form lugs will have to be moved to conform with anchor bolts.

Crew has not been disrupted by other departments borrowing carpenters for performing odd jobs.

All anchor bolts in proper location; the shifting of the channel lugs was due to type of pour on previous lift.

Carpenter No. 2000 received slight injury to left forearm. Taken care of by foreman in usual way. Time occurred 10:15 A.M.

Trouble encountered in aligning two 12-ft. panels on west side; left end of lagging had to be cut off 3/4 in. to allow panel to be pulled in position.

No change in weather conditions.

DIARY NOTES for same shift accompany daily field report and give all relevant information regarding working conditions, delays, accidents and other factors affecting efficiency and progress.

Ready for
DEFENSE PROGRAM

Says E. J. Harding of A.G.C.

Speaking for Construction Industry

E. J. HARDING
Managing Director of Associated General Contractors of America

THE CONSTRUCTION INDUSTRY is equipped and prepared to perform all national defense construction with the necessary speed, quality and economy, Managing Director Edward J. Harding, of the Associated General Contractors of America, said Aug. 11. A survey by the A.G.C. staff shows that any doubts about the performance of the construction program are unfounded, he said. The text of his statement follows:

Before the country can arm, equip and house an army of 2,000,000 men and a navy twice the present size, new plants must be constructed for manufacture of arms and supplies, means of transportation must be improved, men and materials must be given shelter, and many other facilities must be built. On the speed with which this job is done depends much of the speed with which the whole defense program can proceed. This means that the job for the construction industry is of vital importance. The industry is equipped and prepared to perform all national defense construction with the necessary speed, quality and economy.

Size of Program

The size of the construction program determines the ability of the industry to perform it without delay. Final estimates of the ultimate amount of construction in the defense program cannot be made accurately now. For the first phase of the construction program approximately $1,000,000,000 in federal appropriations for construction purposes are now available or soon will be available. In the near future approximately another $500,000,000 of private funds or government loans will be used for construction. This gives a total defense construction program of approximately $1,500,000,000 to be started this year and next. This is a large amount of construction. Yet in terms of yearly volumes of construction it is less impressive, being about one-eighth of the present yearly capacity of the industry.

Construction Survey

A survey recently made by the Associated General Contractors of America indicates that the present capacity of the construction industry is approximately $12,000,000,000 a year. The total volume of construction for 1939 was approximately $9,947,000,000. It is estimated that in 1940 an increase in the amount of private construction will be more than balanced by a decrease of public construction, so that the total volume of construction, including defense construction, is not expected to exceed the 1939 total.

This means that there will be an unused capacity of approximately $2,000,000,000. The defense construction program offers nothing in size which the construction industry cannot handle easily. The defense program will simply take the place of the Public Works Administration program, which is substantially completed and was equal in size to the defense construction program.

General Contractors—The general contracting branch of the industry has the central responsibility for coordinating all the facilities of the industry, and for actual construction of projects. The A.G.C. has found that there are enough competent, adequately financed contractors so that general contracting will become no bottleneck.

Man Power

Available man-power is a controlling factor in the volume of construction which can be performed annually. The A.G.C. survey accounted for approximately 2,600,000 construction workers, adequate for an annual volume of $12,000,000,000. In the tabulation full account has been taken of such loss of man-power as has been sustained the last few years through aging of workmen, shifting to other industries and the training of relatively few new mechanics.

Equipment — Plant and equipment owned by contractors has been conservatively estimated at $500,000,000 at its present depreciated value, not at its replacement cost. Constant improvement of equipment increases the capacity of the industry. No shortage of new equipment is foreseen, although many manufacturers will be making war materials.

Materials — No shortage of supplies or materials is foreseen in the near future.

Type of Construction

Much of the construction for the defense program will be of ordinary or simple type which large numbers of contractors will be able to perform easily. Other projects will be specialized and complicated. But the construction industry has been cooperating with all American industry, and the Army and Navy, in the construction of specialized facilities for many years. New records are being made constantly for the speedy completion of specialized projects.

Location—Much of the defense construction will be located in out-of-the-way and sparsely inhabited locations. But the construction industry, by its nature, is a mobile industry, for it is a normal procedure to construct unusual projects in unusual locations. It is normal for the industry to mobilize small armies of construction workers for jobs unprecedented in size for the community. It is a characteristic of the industry that it draws its workers from the locality of the project, but augments these with workers from other places. This mobility is one of the fascinations the industry has for many workers. The construction of such giant projects as Boulder dam and Grand Coulee dam demonstrates the capacity of the industry to undertake even its largest projects in distant localities.

Full Cooperation Assured

The type of cooperation which the construction industry has already given the government in the defense program is illustrated by a report of Secretary of Navy Knox at a press conference Aug. 7. He said that construction of naval air bases in the Pacific had progressed at so rapid a rate that they would be ready for use months ahead of the time fixed in the construction contracts. Rear Admiral Claude C. Bloch, commandant of the Fourteenth Naval District, at Honolulu, had reported to him, said Secretary Knox, that the bases are not only being completed ahead of schedule, but also with substantial financial savings to the government.

The present defense program emphasizes the progress which has been made in the construction industry since the World War. Since that time the industry has experienced the skyscraper era, has built the majority of the giant reclamation, flood control and power projects, and has covered the country with a network of highways, the work of an entirely new branch of the construction industry.

The industry and general contractors now are ready and prepared for any emergency.

Speedy Tunneling

MAINTAINED ON 6-MILE CARLTON MINE DRAINAGE BORE

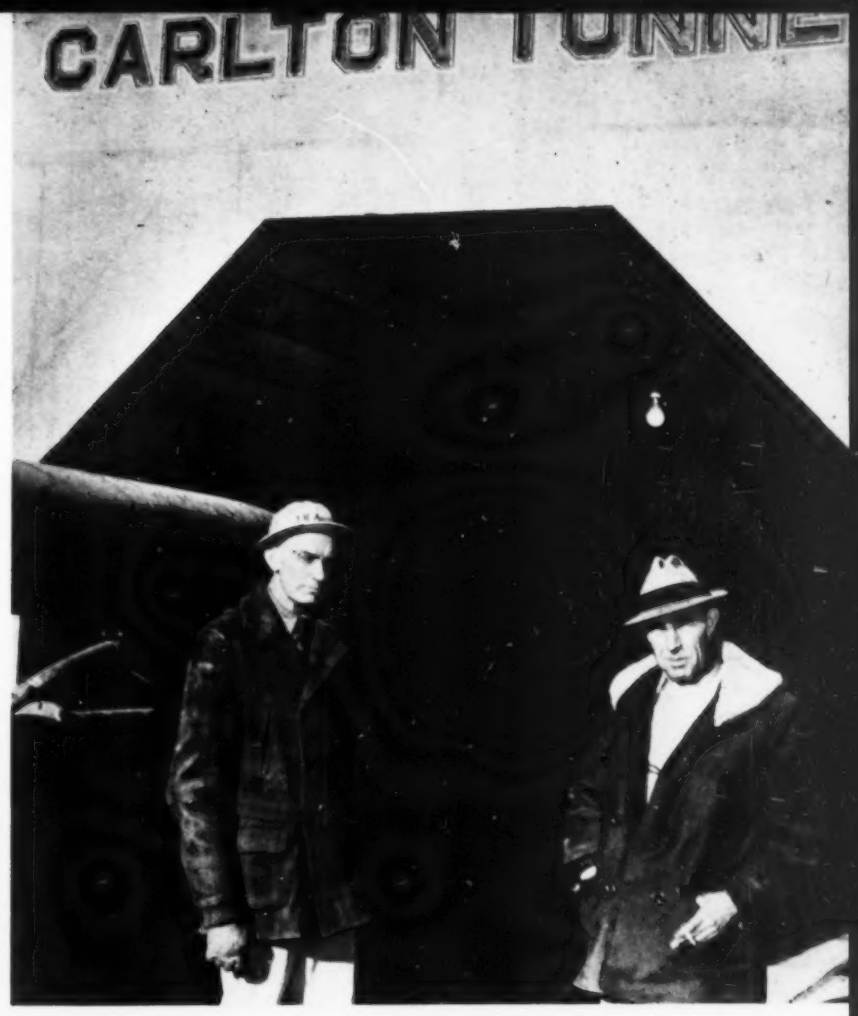
Photos by Thos. J. Barbre

DRILL JUMBO, 20 ft. long and weighing 5 tons, without equipment, mounts five drifter drills on column-arms at front end, another drill at rear for holes in tunnel roof and stopehammer at side for holes in walls. At right, Superintendent John R. Austin towers alongside drill carriage.

SPEED IN TUNNEL-DRIVING, with a single heading advancing as much as 1,879 ft. in a period of 31 days, has characterized the building of the 32,000-ft. long Carlton tunnel, now under construction by forces of the Golden Cycle Corp. to drain gold-bearing ore bodies in the vicinity of Cripple Creek, Colo. and extend mining operations to depths now prohibited by excessive inflows of ground water. With a cross-section 10 ft. wide and 11 ft. high, the tunnel is being drilled and blasted through granite varying in hardness from a brittle rock to a soft, spongy material.

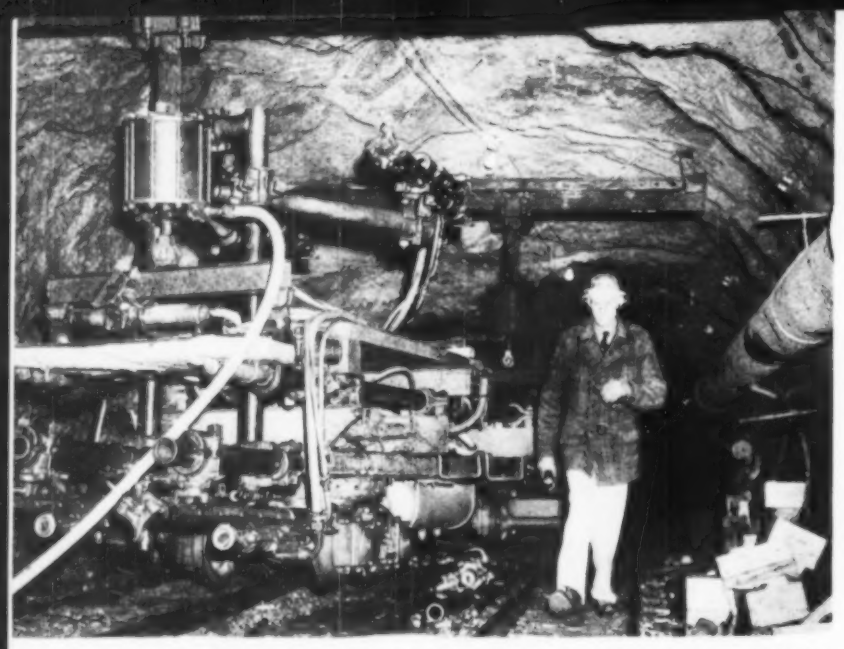
Working three 8-hr. shifts per day, seven days a week, the tunnel-driving crews, under the direction of John R. Austin, superintendent, have advanced the heading 74 ft. in a single day and, on the long pull, have driven 2 mi. of tunnel in 209 working days. The results attained are attributed to a smooth-working organization, selection of modern equipment adequate in amount and type for the job in hand and the payment of a bonus to the workers for rates of progress above a specified minimum.

From a portal 8½ mi. south of Cripple Creek, tunneling

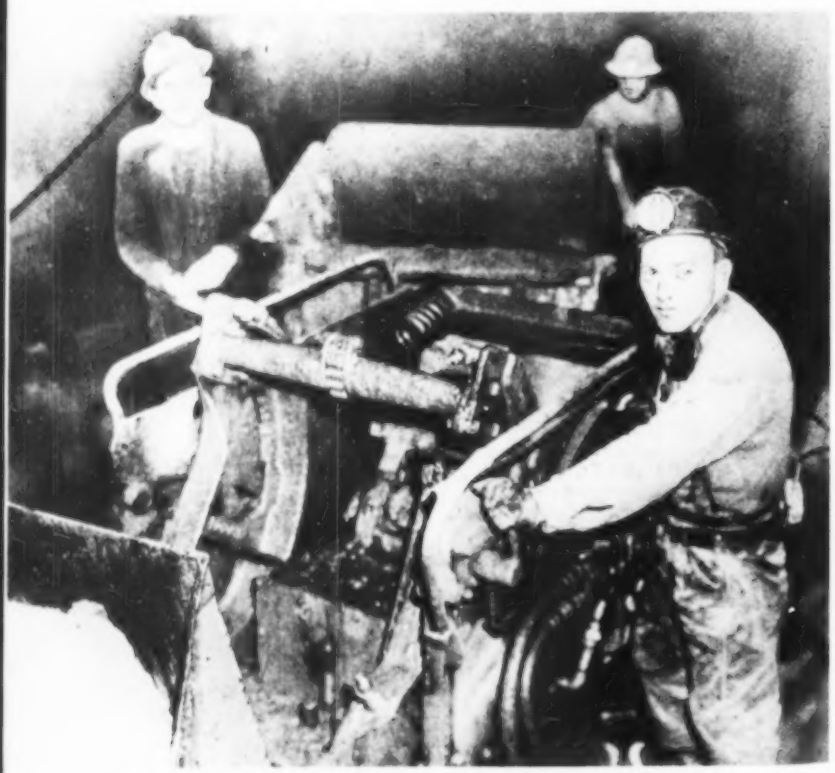


CONSTRUCTION RESPONSIBILITIES for maintaining rapid progress on the 6-mi. Carlton drainage tunnel rest upon the shoulders of tall (6 ft. 8 in.) JOHN R. AUSTIN, **(left)** superintendent, and ALFRED H. BEEBE, vice-president, Golden Cycle Corp.

LOADING OF DRILL HOLES (below) with explosive charges is done after drill columns on jumbo have been folded back out of the way to provide standing room for powder crew.



PAIR OF I-BEAMS, supported 15 ft. apart from tunnel roof, carry air hoists which pick up drill jumbo and move it laterally to clear track for removal of muck in trains of mine cars. Tunnel is slabbed off every 3,000 ft. to provide recess for receiving drill jumbo.

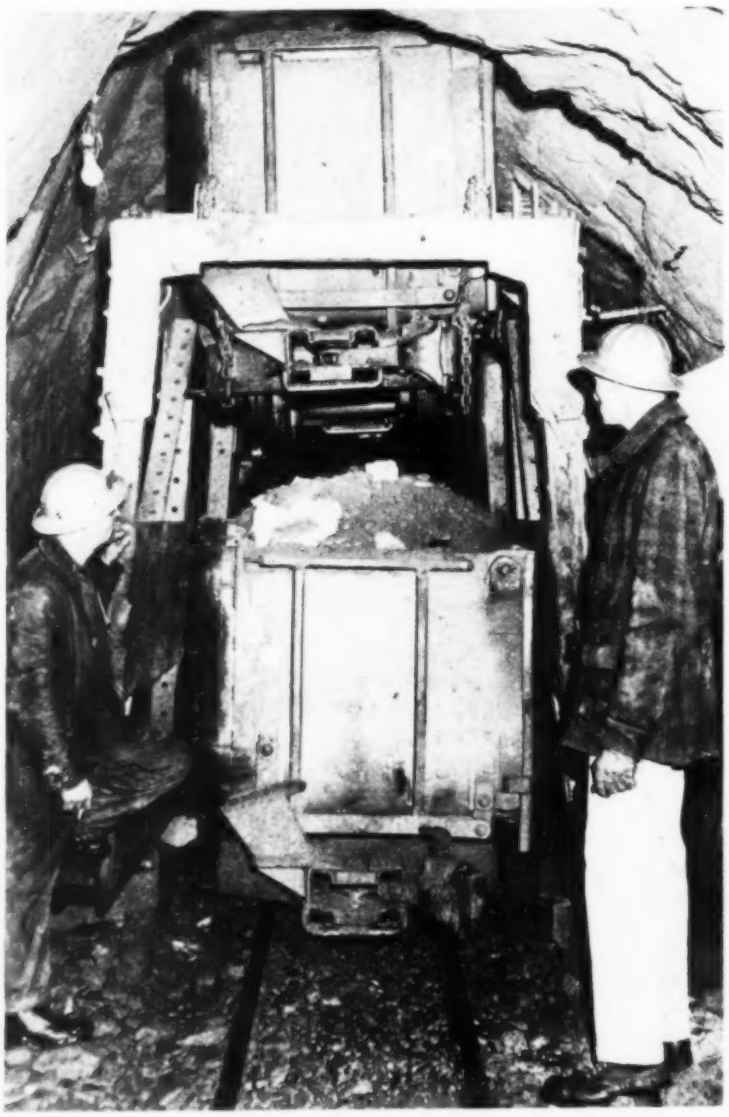


REMOVAL OF BLASTED ROCK from heading is done with mechanical loader, powered by air motors. Bucket of this machine picks up muck from tunnel floor and moves in vertical arc to discharge its load into mine cars. Time for mucking 8-ft. rounds is 50-60 min.

FIRING OF BLASTS (below) in heading is done electrically by hooking up loaded drill holes to storage batteries of tunnel locomotive ordinarily used for haulage of muck and men. Operating fire switch is Shift Boss Stiles, with J. G. Farmer, tunnel engineer, in center.

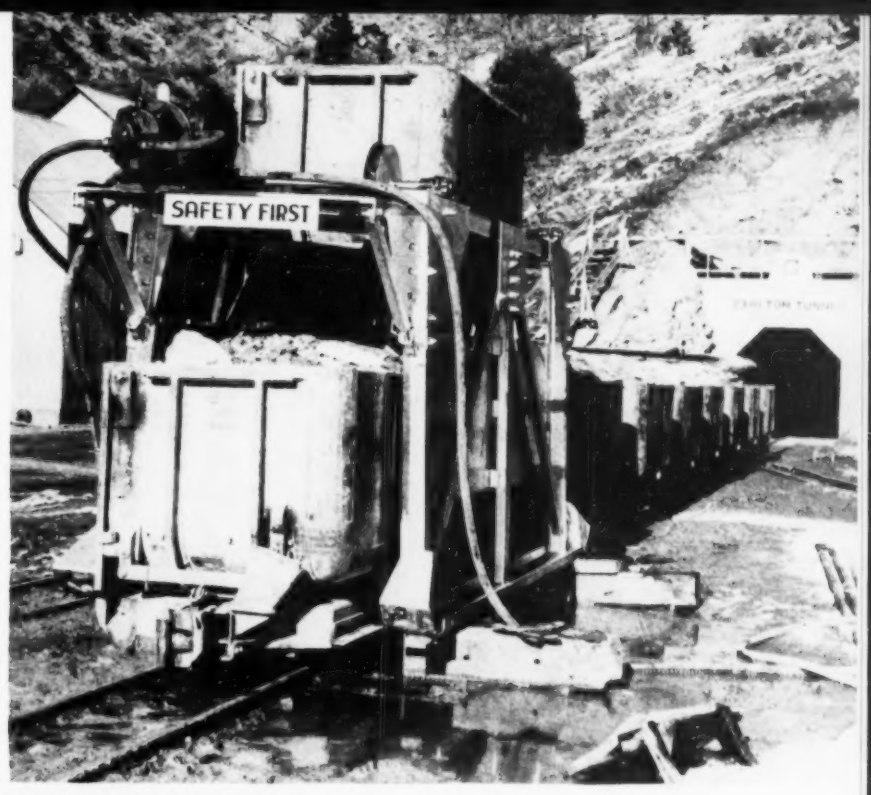
was started in July 1939, extending at a grade of 0.3 per cent through rock which required no timbering beyond the first 336 ft. At the end of its 6-mi. length the Carlton tunnel will pass about 200 ft. beneath the bottom of the deepest mine shaft (3,037 ft.) previously sunk to facilitate the extraction of gold from the Cripple Creek district. Drilling is done from a steel frame jumbo 20 ft. long and weighing 5 tons without equipment, upon the front end of which are mounted five Ingersoll-Rand drifter drills, with power feed; on the rear of the jumbo is another drifter for drilling the tunnel roof to provide clearance at intervals for the vertical shifting of mine cars by a "cherry-picker," while a stopehammer is mounted on the side for putting in holes in the rock wall for expansion bolts to carry air and water lines. When the jumbo is moved, the column arms carrying the drills are folded back parallel to the tunnel line so that the unit can pass through the cherry-picker.

For the 10x11-ft. tunnel face, a drilling round requires from 37 to 42 holes (depending on the character of the rock), each hole being about 9 ft. deep. At first drilling was done with conventional forged steel, but in September of last year a change was made to detachable bits. This change made it possible to reduce the gage of the drill steel for starting the holes. From 2½ in. at the beginning of the work the gage first was cut to 2¼ in. and finally to 1¾ in., resulting in faster drilling, less air consumption and reduced blacksmith personnel. With Jackbits fastened to 1¼-in. hollow steel rods, drilling time during the month of April averaged 13½



CHERRY-PICKER of improved design for switching mine cars back of heading consists of movable steel frame equipped with air hoist to raise empty car vertically and allow passage of loaded car beneath it. Vertical clearance for operation of machine, inspected by Master Mechanic Bob Welch (left) and Superintendent J. R. Austin, is provided every 100-200 ft. by slabbing off 2 ft. from tunnel roof.

DETACHABLE DRILL BITS are sharpened by grinding for reuse in tunnel heading.



FOR SHIFTING MINE CARS here is another view of the cherry-picker, taken outside the tunnel. Air-hoist raises empty car vertically so that train of loaded cars can pass beneath.

min. per foot of advance. For a hole 9 ft. deep four rods having lengths of 3, 5, 7 and 9 ft. are used, successively; each change of rods involves a reduction of $\frac{1}{16}$ in. in the gage of the detachable bit, with the hole bottomed out at $1\frac{9}{16}$ in. The bits are reconditioned after use by hot milling at the blacksmith shop.

Drill holes are loaded with Du Pont Gelex No. 1 and 65-per cent Hercules Hercomite. Firing is done electrically with delay blasting caps receiving current from the batteries of one of the electric locomotives used to haul tunnel muck.

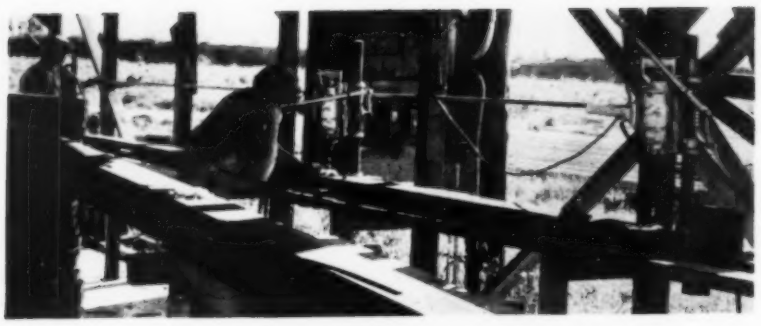
Drilling and ventilating needs are served by a compressor plant at the tunnel portal comprising two Ingersoll-Rand compressors with a combined capacity of 1,800 cu.ft. per minute supplying air to the drills at 125 lb. per square inch. Air for drilling is conveyed to the heading through 6-in. welded steel pipe in 60-ft. lengths connected by flanged joints. An electrically powered blower exhausts air from the heading, after blasting, through an 18-in. steel vent pipe at the

(Continued on page 101)

TUNNEL MUCK is removed from heading in these 87-cu.ft. cars. Extended arm on side of car, which is retracted when not in use, runs up over block at left of track, causing car to tilt and discharge.

TUNNEL HAULAGE (below) is done with 8-ton, 56-cell, storage battery locomotives operating on 2-ft. gage track of 45-lb. rails. Atop cars is a 40-ft. section of 18-in.-diameter welded steel ventilating pipe, with flanged joints.

SMALL TOOLS ON CONSTRUCTION

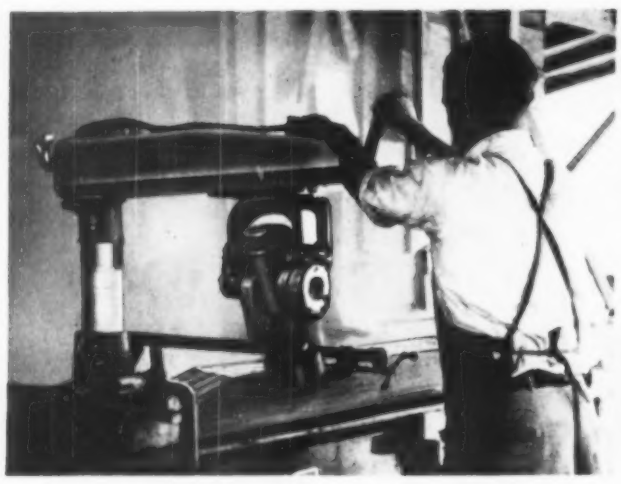


1

Roof Trusses

CUT AND ASSEMBLED WITH SMALL TOOLS

THE ACCOMPANYING PHOTOGRAPHS illustrate how small tools were utilized by the George A. Fuller Co. in precutting and assembling wood roof trusses for the 88-unit Carmelitos housing project at Long Beach, Calif., described in detail on page 56 of this issue.



2

3

1 THREE ELECTRIC DRILLS are mounted over a bench in such a way that when timber to be bored is set in place against stops, workmen merely operate drill levers of Skillsaw units and three holes are made in right places.

2 RAFTERS FOR TRUSSES require bevel cuts, of course, and these are made by a De Walt cutterhead, set to rout out notches at high rate of speed. Operator pulls cutterhead across group of four 2x8-in. rafters set against stops on machine bed.

3 GROOVES for split-ring connectors in bottom chord truss joints are made with Black & Decker ¾-in. utility drill. To speed this operation, layer of these members is placed on stock pile adjoining truss assembly templet and then workman moves along layer, cutting grooves around drilled holes already made.

4

5

4 TWO WORKMEN are stationed at truss assembly templet, each assigned to certain work. Bolts are kept in boxes beneath templet.

5 SPANNER WRENCH is used to tighten up bolted joint of roof truss. In left center is pressure spray tank used for supplementing chemical preservative treatment.

6 AFTER TRUSS IS ASSEMBLED, third workman leaves nearby job to help wheel it away on pneumatic-tired cart to stacking pile similar to one here seen in background.

7 ASSEMBLED ROOF - TRUSSES are stored in long rows ready for transport to buildings.

6

7

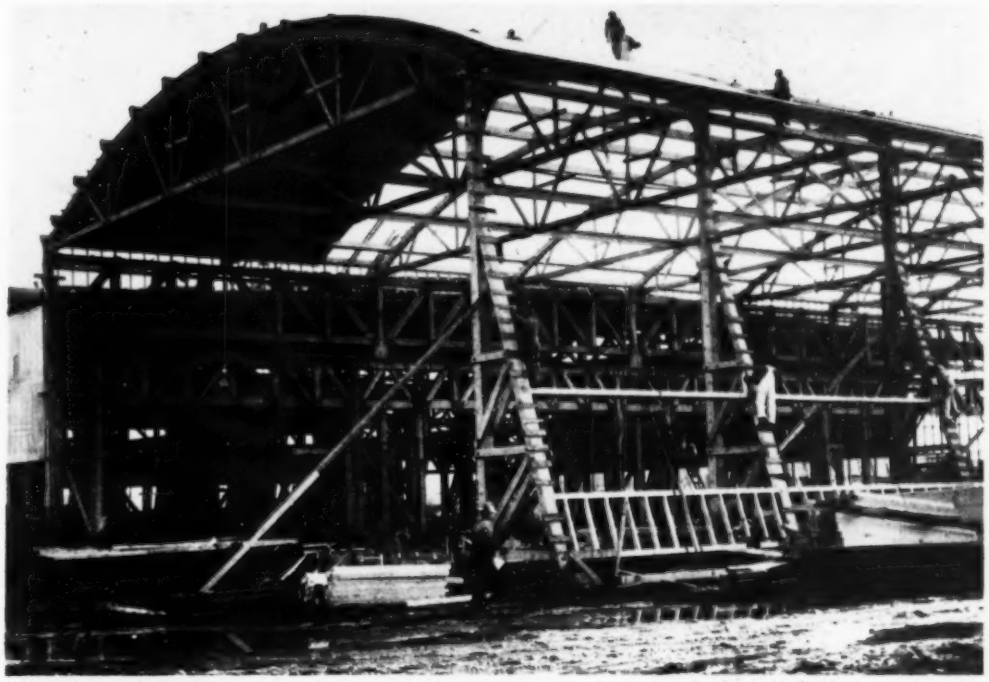
Timber Trusses

CARRY SHOP ROOFS FOR 2½-ACRE SHIPYARD PLANT

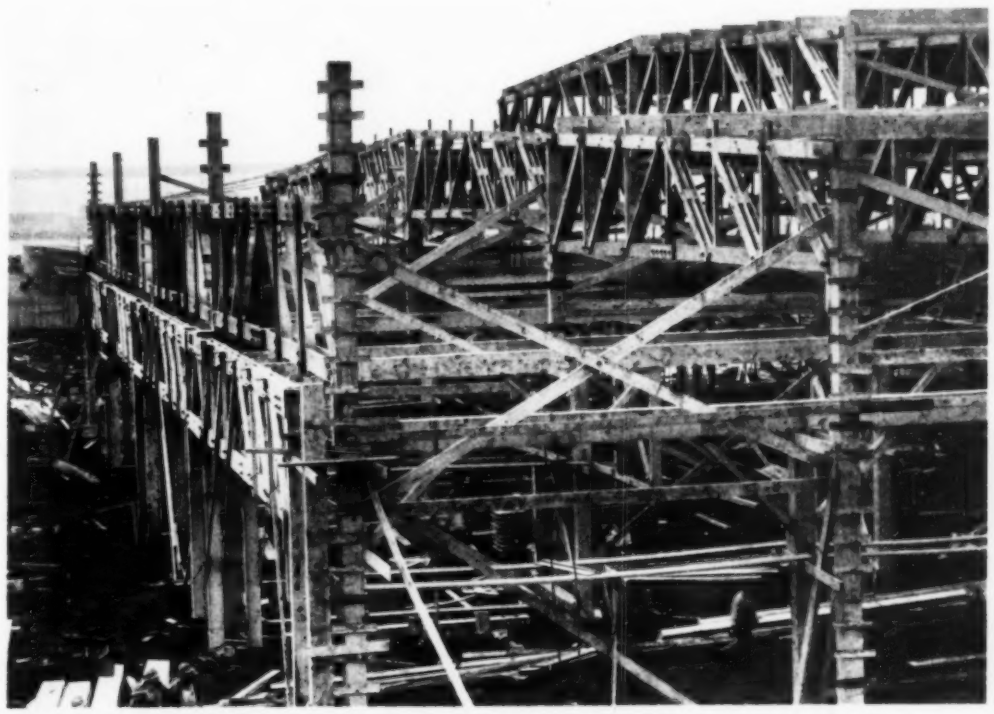
IN THE PACIFIC NORTHWEST timber construction is used so extensively and so effectively that when shops were required to cover some 2½ acres of the new Seattle-Tacoma Shipbuilding Corp.'s yard at Tacoma, Wash., it was natural that timber should be chosen as the principal construction material even for roof trusses of 130-ft. span. Twelve 130-ft. trusses were required, and altogether there are 72 with spans of 50 ft. or more.

Fabrication on the trusses began on Nov. 1 and was completed Dec. 21. Truss erection was finished in the first week of January. Largest of the buildings arranged around the two shipways is the two-story mold loft with an unobstructed floor area of 130x260 ft.

The shipyard as a whole, which is being erected to construct five 6,800-ton freighters for the U. S. Maritime Commission, required 2,650,000 ft.b.m., of structural timber. The contract was held by the General Construction Co., Seattle, Charles W. Fitton, engineer in charge. Trusses were designed by Timber Structures, Inc. Lumber was furnished by the Henry Mill & Timber Co., Tacoma. Teco split-ring connectors were used throughout the job in timber joints; all heel plates and metal fastenings in the trusses were attached with Teco flush-type shear plates.



ROOFING MATERIAL for assembly shop, raised by cranes, included 6x12- and 6x14-in. purlins on which were laid 2-in. tongue-and-groove planks.



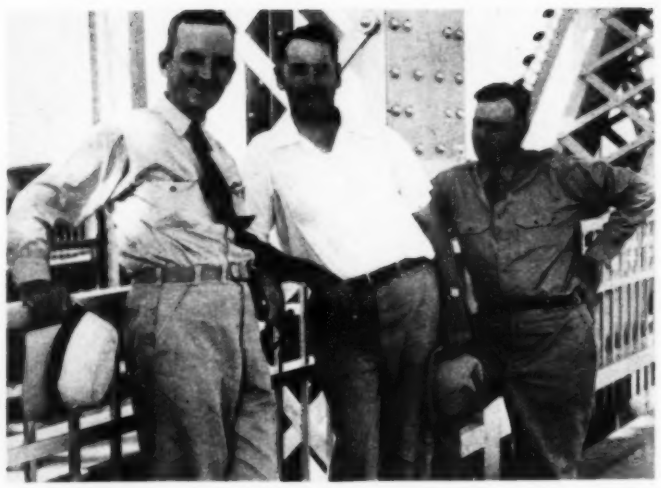
TYPICAL TIMBER TRUSS construction has joints made with split-ring connectors.

LAUNCHING WAYS are in foreground, mold loft in left background, and assembly shop under construction in center background at Tacoma shipyard.

Present and Accounted For

A PAGE OF PERSONALITIES

AT INDIAN ROCK DAM, $1,206,000 rolled earth embankment for flood control on Codorus Creek near York, Pa., engineering and construction personnel of U. S. Engineer Department and of Benjamin Foster Co., contractor, of Philadelphia, include (left to right): JAMES SHOCKLEY, in charge of tunnel excavation for Foster Company; JAMES A. McCARTHY, inspector and EDWIN G. FISKE, construction survey section, U. S. Engineer Department; ANTHONY LUGANO, superintendent, ARTHUR DUNN, chief civil engineer and W. R. FRANZ, manager of construction division, Foster organization; JAMES A. STOCKLEY, inspector, GUY PICKETT, resident engineer and A. E. STEERE, area engineer, U. S. Engineer Department.



NEW MISSISSIPPI RIVER BRIDGE at Baton Rouge, La., forms background for engineering personnel in responsible charge of project for state and federal departments. (Left to right) N. E. LANT, bridge engineer, Louisiana Highway Commission; C. T. NITTEBERG, senior highway bridge engineer, Public Roads Administration, District 6; E. L. ERICKSON, construction engineer, Louisiana Highway Commission.

Herb Foster Photo

DEDICATION OF JAMESTOWN BRIDGE across Narragansett Bay, Rhode Island, is participated in by engineering and construction personnel, including, (left to right): WILLIAM H. BRUCE, resident engineer for Parsons, Klapp Brinckerhoff & Douglas, consulting engineers; FRANK BARNES, construction manager for Merritt-Chapman & Scott Corp., substructure contractors; E. L. MACDONALD, chief engineer for consulting engineers; and THOMAS HARRIS, of Harris Structural Steel Co., superstructure contractors.

MAJOR C. N. IRY, Corps of Engineers, U. S. Army, is the officer now in charge of completing Fort Peck dam in Montana. He succeeded Lieut.-Col. Clark Kittrell, transferred to U. S. Engineer District at New Orleans.

START OF CONCRETING July 29, at Friant dam, U. S. Bureau of Reclamation structure in California, takes place under supervision of (left to right): HARVEY SLOCUM, general superintendent for Griffith Co. and Bent Co., contractors; WALKER R. YOUNG, supervising engineer of U.S.B.R. Central Valley project; and R. B. WILLIAMS, construction engineer of U.S.B.R. Friant Division.

W. H. HARRISON, vice-president and chief engineer of American Telephone & Telegraph Co., is newly appointed director of Construction Division National Defense Advisory Commission, Washington, D. C.

CONSTRUCTION EQUIPMENT NEWS

(ALL RIGHTS RESERVED)

Review of Construction Machinery and Materials for SEPTEMBER, 1940

NEW TYPE OF EARTH DRILL for U. S. Army is mounted on truck and will be used for laying land mines and building tank traps. They dig holes 50 ft. deep and 42 in. in diameter. In ordinary soil or soft rock they'll dig a hole 6 ft. deep and 20 in. in diameter in 3 min. They can work at angle of 45 deg —**The Buda Co., Harvey, Ill.**

DUMP WAGON, an improved "Dumptor" is claimed to have three advantages over previous models: (1) More trips per hour; (2) bigger payloads per trip; (3) lower fuel cost per yard. Features said to make these advantages possible: (1) Short wheelbase and compact chassis design permit easy spotting and loading; (2) heavy-duty construction and absence of mechanical complications make for low maintenance costs; (3) free oscillating steering axle eliminates bending strains when traveling over rough or uneven terrain and permits travel on and off fill or over furrows as high as 21 in.; (4) alloy steel axles housed in one-piece alloy steel casting; (5) transmission gears compactly assembled and connected by flexible chains to final drive sprockets; (6) operator provided with comfortable seat and protected by cowl with door. All levers within easy reach. Powered by diesel or gasoline engine.—**Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.**

★ ★ ★

SELF-PROPELLED MOTOR CAR-COMPRESSOR COMBINATION for use of railroads on branch lines or of maintenance crews, and known as Railcar, consists of Model 60 Fordair engine installed in Fairmont motor car and compressor of 60-cu.ft. capacity and speed of 1,390 r.p.m. Unit will operate four tie tampers, small rock drill, rotary drills, breakers, spray guns and other air tools. Carries crew and equipment at speeds up to maximum of 20 m.p.h. and also supplies air from 14x26-in. tank mounted beneath seat. Track gage, 56½ in. standard; other gages, 36 in. and up. Three-speed transmission and self-centering brakes supplied. Differential axle—no loose wheels. Electric starter.—**Schramm, Inc., West Chester, Pa.**

LIGHT-DUTY PORTABLE ELECTRIC DRILL, ½-in. capacity, called Thor Drill Champion, is designed for intermittent service in automotive, electrical, plumbing and similar installation and maintenance work. Drills both in wood and metal. Weight, 9¼ lb.; size, 15¼ in. overall. Effective for use in hard-to-

reach places. Feature: Powerful motor and extra heavy tooth pitch gears for transmitting power to chuck. Large air intake keeps motor cool. Standard equipment includes double pole momentary switch, fully inclosed in dust-proof compartment in switch handle, spade handle and removable dead handle. Spring clip retainer for chuck key, 3-jaw Jacobs chuck and 3-conductor cable and plug are furnished.—**Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill.**

5 YEARS *Ahead*

Only JAEGER Offers This Modern Type "H" Finisher

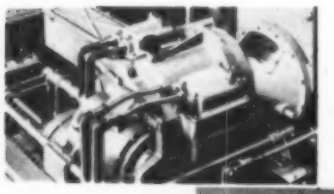
NEW SPEED AND TRACTION to match 34E Dual Drum Pavers and Jaeger Screw Spreaders on dry mixes. 4-Speed Automotive Transmission has working speeds to 18 F.P.M., smooth, positive drive to 4 equally loaded wheels.

NEW SMOOTHNESS OF FINISH with rigid, fully enclosed, spring cushioned 12" screeds, independently controlled.

COMPLETE CONTROL—all levers banked in front of operator, including separate screed and traction speeds, fast hydraulic power lift for each screed.

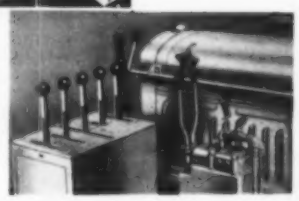
4 FT. TELESCOPIC WIDTH CHANGES — Central unit and side trucks completely self-contained. Quickly extend Telescopic Frame and insert Screed Sections for built-in width changes; merely insert wider cross members and screeds for widths to 30 ft. Merely move wheels for ¼" to 3" adjustments.

Send for New Bulletin SF-40



SINGLE HEAVY DUTY AUTOMOTIVE TRANSMISSION with 4 Speeds

ALL CONTROLS BANKED IN EASY REACH FROM FRONT OR REAR — Independent Screed Control

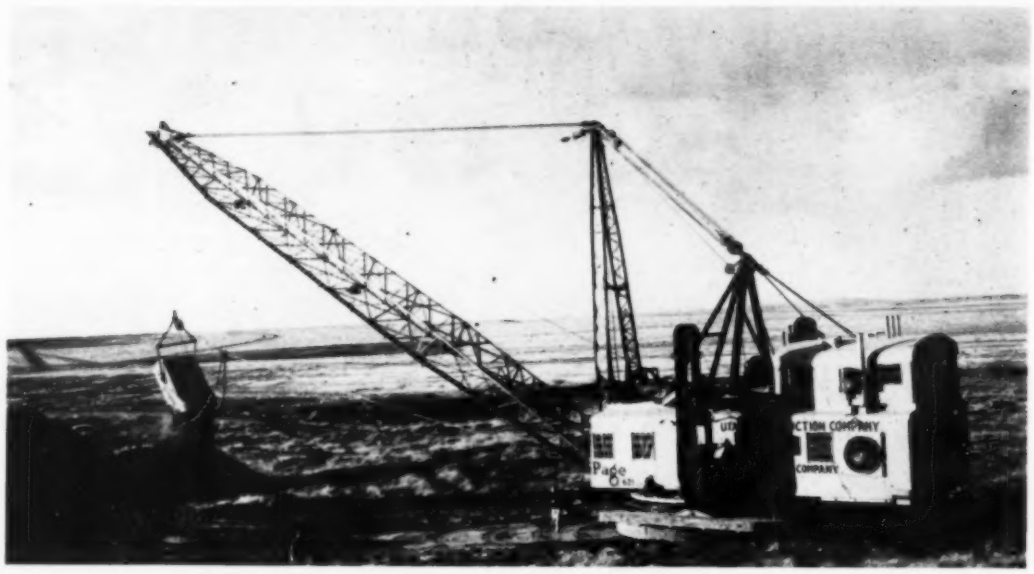


JAEGER SCREW SPREADERS Re-Mix, Densify

A necessity with Dual Drum Pavers — Easily spread and strike off 100 cu. yds. per hour.

THE JAEGER MACHINE CO.

800 Dublin Ave., Columbus, Ohio



TWO-ENGINE DIESEL-POWERED WALKING DRAGLINE is equipped with two power units. Larger engine provides power for loading and hoisting, while smaller one swings as rapidly as faster hoist demands. This combination said to furnish perfectly balanced power and to increase number of loaded buckets that can be handled per minute. Moreover, makers claim that dragline is not cumbersome and more compact than single engine dragline carrying same total horsepower.—**Page Engineering Co., c/o Clearing Post Office, Chicago, Ill.**

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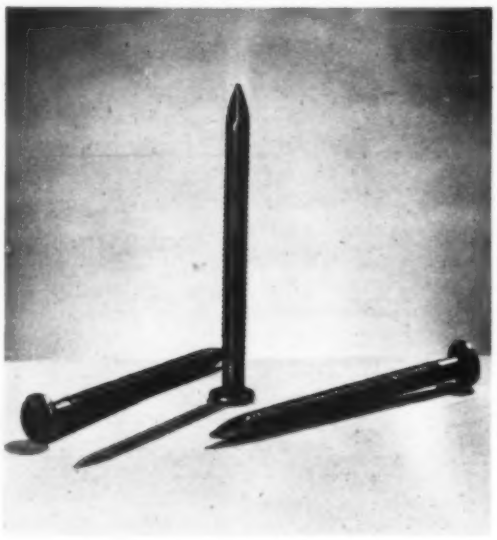

RUSTPROOF NAIL of Monel metal known as "Anchorfast," for use in construction, is said to have unusual holding power derived from series of sharp, annular grooves, set at such an angle that in driving they do not disrupt fibres of wood. May be driven quickly without drilling pilot hole, even into oak. Requires no clinching. Another feature is exceptionally heavy head which in case of 2-in. nail, measures 5/16 in. in diameter and 1/16 in. in thickness. Countersinking not required. Permanently rustproof and resistant to salt water and other corrosive agents, including tannic acid. —**Independent Nail & Packing Co., Bridgewater, Mass.**

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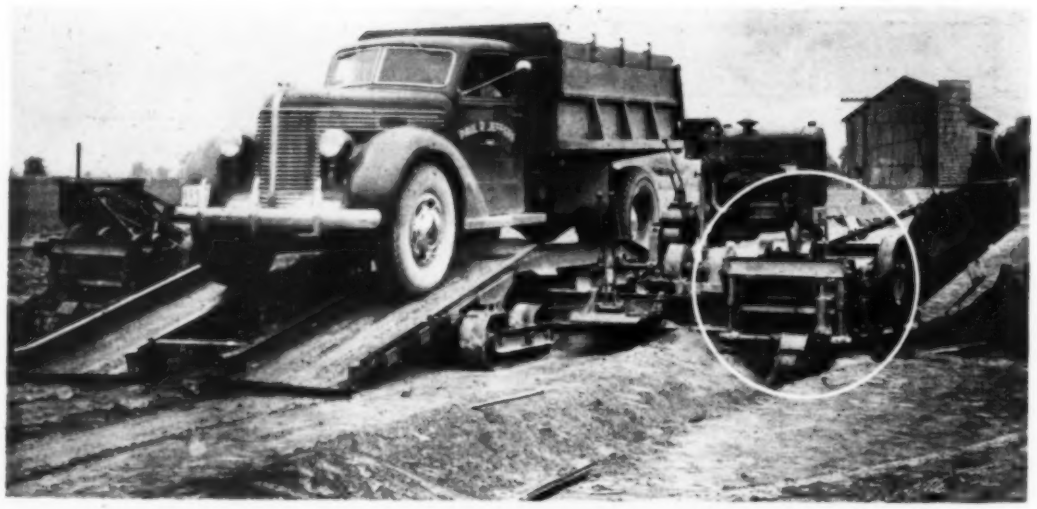
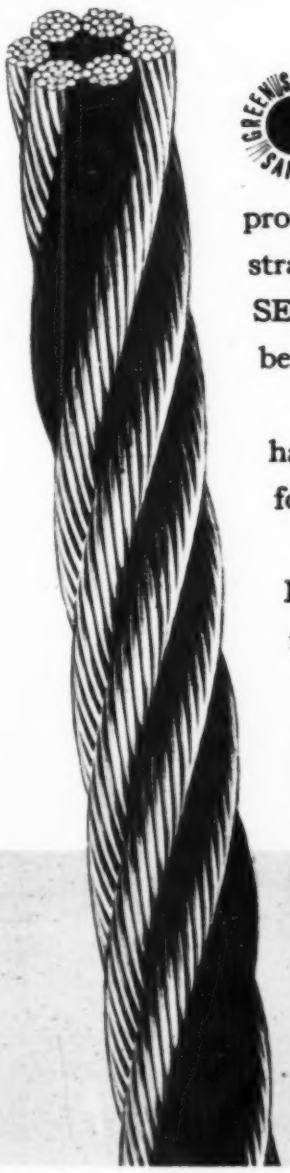


NEW DEVELOPMENT in R. B. Finegrader consists of relocation of form wheels which now are spaced so that at no time is one side of machine resting entirely upon one section of form. Wheelbase has been lengthened so that when front wheels on either side are resting on one section of form, back wheels will be resting on form section behind this. Such distribution of weight of machine between two forms on each side, four in all, overcomes tendency of forms to settle at joints. Another improvement is use of rubber-tired wheels when machine is used for grading next to completed section of slab. Regular steel form wheels are used on one side, but on pavement side rubber-tired wheels are used to prevent damage to slab and to provide smooth, easy operation. Interchangeable with regular steel wheels and easily installed on job.—**Buckeye Traction Ditcher Co., Findlay, Ohio.**

HAZARD LAY-SET *Preformed* Handles Easier



Whether it is on a carryall, dragline, concrete mixer, power shovel, clamshell, skip hoist—or what not—Hazard LAY-SET Preformed is appreciated by the workmen *because it handles easier*. The preforming process, back at the mill, gives it that advantage. Preforming eliminates internal strain thereby making LAY-SET limber, flexible, easy to reeve. Therefore, LAY-SET resists kinking, resists rotating in sheave grooves, resists the fatigue of bending. LAY-SET requires no seizing as it won't fly apart when cut.

Crown wires that finally wear through will not porcupine to tear workmen's hands and possibly cause blood poisoning. This makes Hazard LAY-SET Preformed a *safer* rope to use. Small wonder the workmen like it.

The bosses in the office like it, too, for the records reveal that Hazard LAY-SET Preformed lasts longer. *Much* longer. That means less frequent rope replacements and shutdowns—more work done.

Specify Hazard LAY-SET Preformed for your next line. All Hazard ropes made of Improved Plow Steel are identified by the Green Strand—and remember, Green Signifies Safety for both men and pocketbook.

HAZARD WIRE ROPE DIVISION

Established 1846

AMERICAN CHAIN & CABLE COMPANY, INC., WILKES-BARRE, PA.

District Offices: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

"Best Maintenance Tool We Have!" says this Iowa county official

G. M. ANDERSON
FIRST DISTRICT
IOWA

HERMAN T. JURGENS
SECOND DISTRICT
HAMPTON

FRANK B. HEERE
THIRD DISTRICT
WEBSTER

OFFICE OF
FRANKLIN COUNTY
BOARD OF SUPERVISORS

HAMPTON, IOWA
May 13, 1940

The Michigan Power Shovel Company
Benton Harbor, Michigan

Attention: Mr. D. H. Ross

Gentlemen:

Your distributors in Iowa, The Waterloo Construction Company of Waterloo, Iowa, have asked us to write you regarding our experience with your Michigan truck mounted dragline.

We have used your machine entirely for maintenance work and have never measured the yardage moved, therefore we cannot give you the cost per yard for moving dirt. We use it for the following purposes: stripping gravel pits, stock piling gravel from water, pile driving, repairing grades and ditching, filling driveways, digging trenches and placing large diameter concrete pipe, filling baffle walls, loading gravel trucks, filling bridges and miscellaneous small jobs of about every description, that we used to put off and try not to see, because we did not have suitable, economical equipment to do the work.

This is the second full year we have used this dragline, operating it more than 2800 hours in 1938 and more than 2600 hours in 1939. Our operating cost per hour, including operator, have been very surprisingly low, gas consumption running between 15 and 18 gallons per ten-hour day; oil, grease, alcohol, repairs, etc., in like satisfactory proportions.

We keep a map on which we spot jobs for the dragline as they come up. We have never been able in two years to complete all the jobs we find for it to do. It is the best gang maintenance tool we have, and we wonder how we ever got along without it. This is evidenced by the fact that last November we purchased our second Michigan dragline, just like the first one.

Yours very truly,

FRANKLIN COUNTY BOARD OF SUPERVISORS

Frank B. Heere
Chairman

Franklin County, Iowa, is proud of its Michigan Truck Shovels-Cranes — and even more proud of their production and economy records! But read their letter for yourself — typical of the enthusiasm and praise won by convertible Michigan Truck Shovels, Cranes, Clams, Draglines and Trench Hoes in public service and private construction as well. Every month, more and more construction and maintenance men are becoming "MICHIGAN minded". You'll find real dollars and cents reasons for this in Michigan's Work Book — Write for Bulletin CM-90 TODAY.

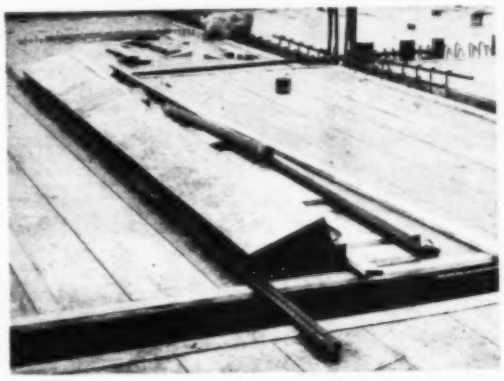
MICHIGAN
AIR CONTROLS
America's Truck Shovel Specialists

MICHIGAN POWER SHOVEL Co. BENTON HARBOR, MICHIGAN U.S.A.

STREET FLUSHER has automatic controls and is said to be easy to operate, and to be able to flush any alleys and streets that trucks will go through. Each flusher nozzle works independently —**Littleford Bros., 443-457 E. Pearl St., Cincinnati, Ohio**

★ ★ ★

NEW TYPE STEEL FORM FOR CONCRETE SLAB FLOORS, named Steelox, has as outstanding feature interlocking flanges that automatically line up panels. Said to be easier and quicker to erect and because of their shape, strength of form provides utmost support with little bracing. To assure

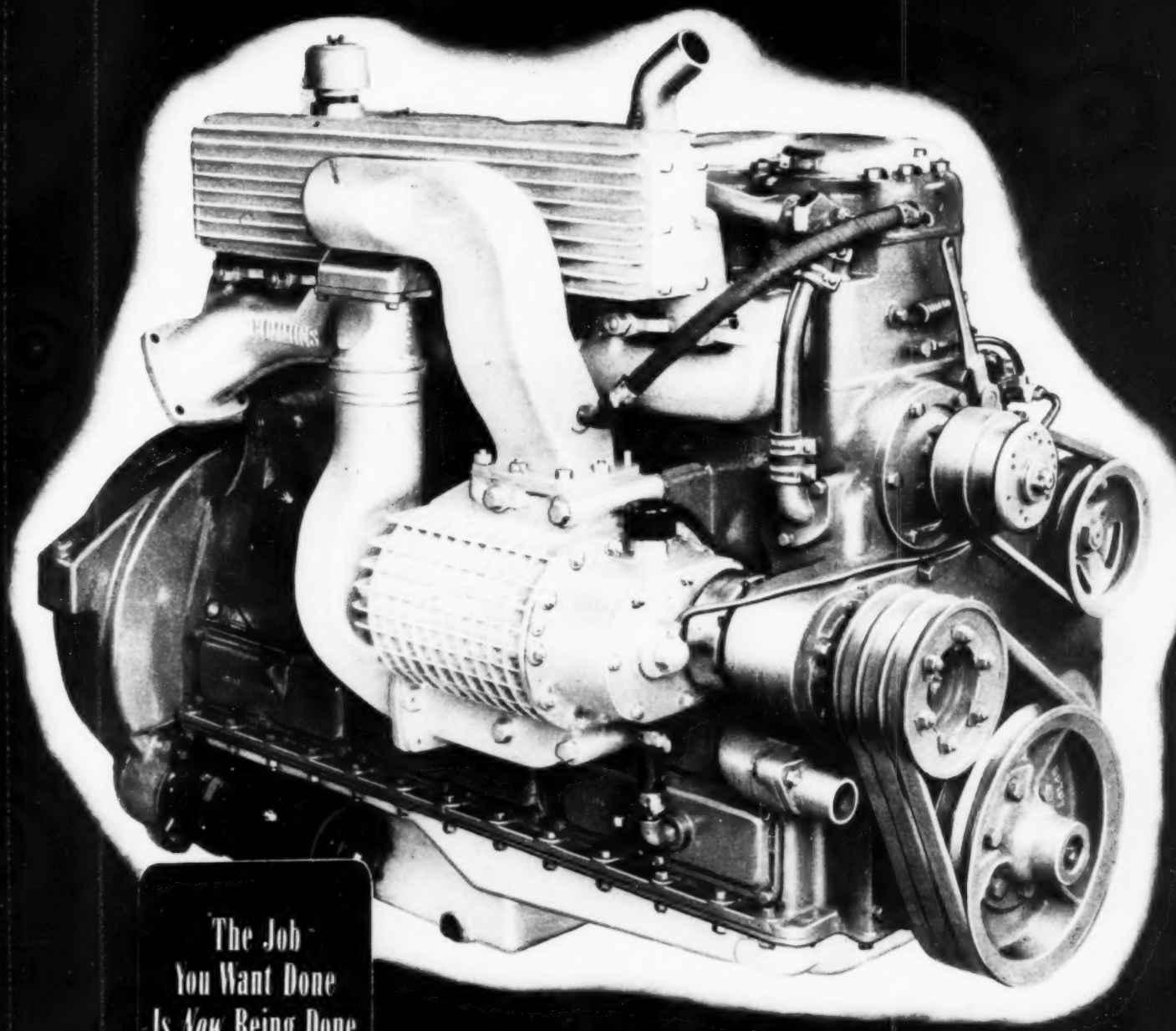


flat surface metal forms are backed with wood. Reshoring claimed to simpler and less costly because key supporting panel is so designed that adjoining panels can be removed. Made-to-order sizes when assembled said to create regular beading pattern at joints, breaking monotony of flat ceiling. Non-porous surface of metal forms dense, smooth-surfaced concrete slab ready to paint, rubbing being eliminated. Less paint said to be required due to absence of porous surface. In most construction work, forms are rented to contractors. —**The American Rolling Mill Co., Middletown, Ohio.**

★ ★ ★

ASBESTOS FRICTION MATERIAL for brake lining and clutch facings is combination of molded and woven structures said to maintain high frictional coefficient with unusual uniformity under widely varying conditions of load and temperature. Furnished to accurate dimensions in all shapes and sizes for brake and clutch requirements.—**Gatke Corp., 228 N. La Salle St., Chicago, Ill.**

THE *Standout* IN
AUTOMOTIVE, INDUSTRIAL & MARINE
DIESEL POWER



The Job
You Want Done
Is *Now* Being Done
with

CUMMINS
Dependable
DIESELS

SUPERCHARGED — one-third more power — less weight and lower fuel and lube oil consumption per horsepower — the same smooth running, quick acceleration, low maintenance and proved dependability that distinguish all Cummins Diesels . . . Write for the folder, "The Logic of Supercharging." Cummins Engine Company, 1716 Wilson Street, Columbus, Indiana.

Laughlin drop forged Safety Clips treat wire rope right. No bending — crimping — or fraying the strands. After removing Laughlin Safety Clips, the rope is straight, unbowed, ready for use again — saving wire rope.

Use Laughlin Safety Clips and avoid rope-crimping with U-Bolt Clips.

FEWER CLIPS NEEDED. Laughlin Safety Clips are so efficient that three of them give you the same strength as four ordinary U-Bolt Clips.

Use Laughlin Safety Clips and save money.

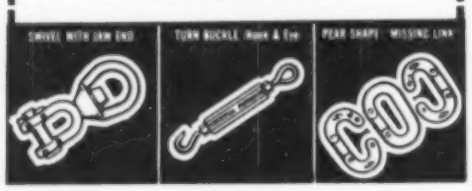
THIS TEST DESCRIBED IN NEW BOOKLET. Tests made by a famous engineering school prove conclusively that Laughlin Safety Clips delivered better than 95% of rope efficiency.

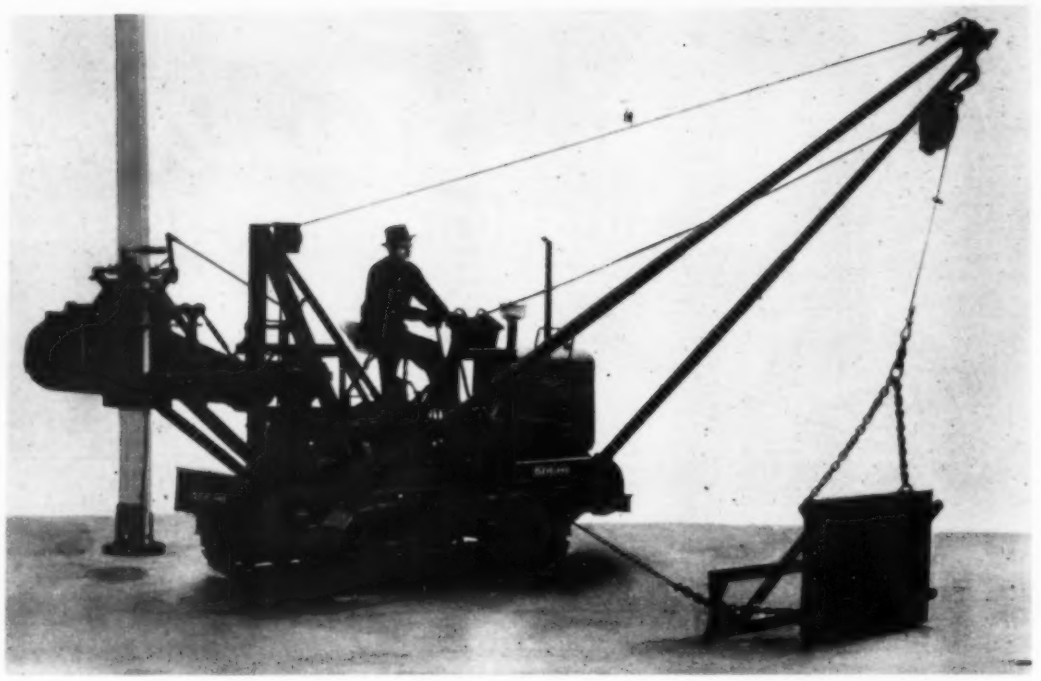
Write for the free booklet that describes these tests — and also the other money and time-saving advantages you get with the modern "fist-grip" clip. Use the coupon below

THE THOMAS LAUGHLIN CO.
Portland, Maine

Please send me free Safety Clip booklet B-8
Name.....
Company.....
Address.....

Check here for catalog on items below ☐
Look for Laughlin products in Thomas' Register and buy through your distributor.





PIPE-LAYING MACHINE performs pipe placing, backfilling and tamping operations at a minimum of time and expense, according to its manufacturers. When backfilling it can work from either side of ditch, and earth can be pulled or pushed in by scraper, as desired. Light scraper permits backfilling where soil has been placed on sidewalks and lawns. Heavier scraper may be quickly attached, if necessary. Machine is equipped with built-in tamping device which drops 175-lb. weight 45 times per minute with resultant impact of 380 ft./lb. Tamping boom said to be quickly movable, permitting taming with machine astride trench or as much as 3½ ft. from edge of trench. Boom and cable winches claimed to be strong enough to permit handling and laying of pipe, pulling of sheathing and other light crane operations. Lifting capacities (without additional counterweights): With load 9 ft. out from edge of crawler, 1,600 lb.; 7 ft. out, 1,800 lb.; 5 ft. out, 3,000 lb.; 3 ft. out, 5,000 lb. Thus manufacturer claims pipe may be laid in tree lawn by machine in street. **—Cleveland Trencher Co., Cleveland, Ohio.**

★ ★ ★

SPECIAL CEMENTS, claimed to accomplish assemblies previously considered impossible, particularly in making strong, waterproof, chemically resistant joints between rubber and metals, are said also to have unique properties in joining a wide variety of other materials, including many synthetic resins, woods and ceramics. Vulcalock cements are translucent, amber liquids of light engine oil consistency; when dried they form tough, horny films. They are not rubber, but are solutions of Thermoprene, a patented thermoplastic made by chemical alteration of rubber. According to manufacturer strength of bond ranges from 10 to 500 lb. per square inch, depending upon method of application and materials joined. Cements are said to resist cracking by bending, shock, or variations in temperature, have chemical resistance better than rubber itself, and do not absorb moisture nor swell in water.—**B. F. Goodrich Co., Akron, Ohio.**

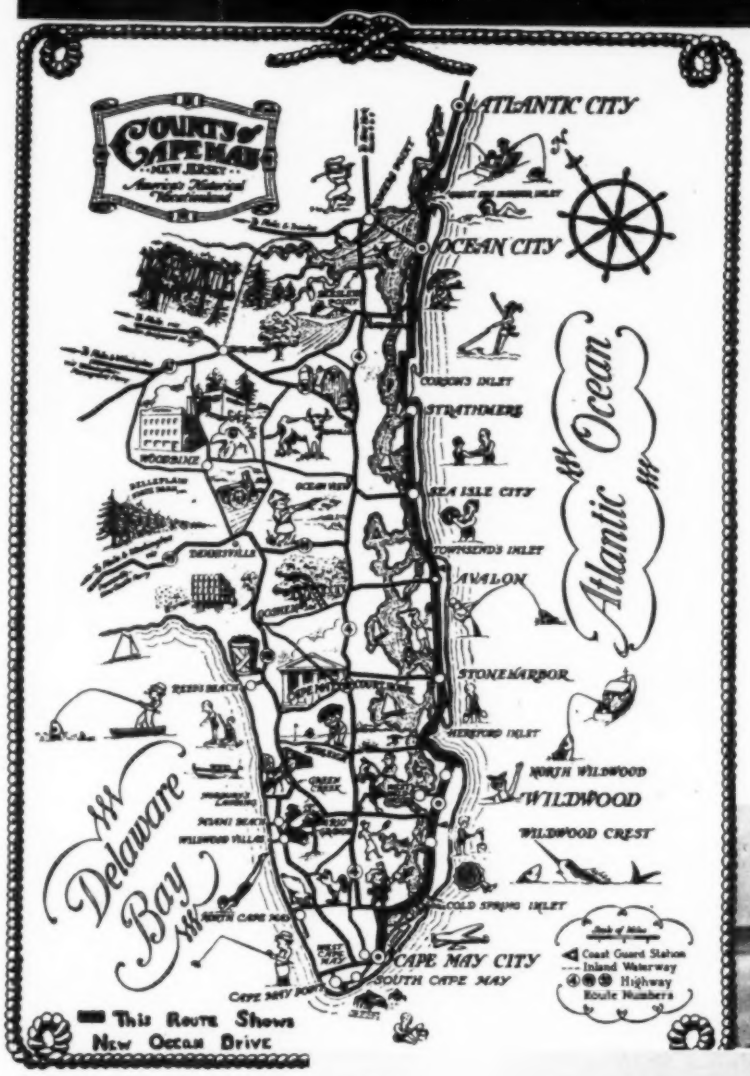
★ ★ ★

LOW-COST MOTOR GRADER for handling road maintenance, average construction work and light ditching has 120-in. wheel base, wide front axle, grader type blade and drawbar, and 10-ft. reversible moldboard. Lifting mechanism easily operated by two large handwheels. With speeds up to 10 m.p.h., it is

claimed that this one-man-operated unit can maintain 3 to 5 mi. of road per hour. Powered by 4-cylinder tractor engine developing 31 hp. at 1,300 r.p.m. with fuel consumption of 1 gal. per hour. Having weight of 5,960 lb., this patrol said to exert blade pressure of 4,780 lb. Drawbar and belt pulley free to do other jobs.—**Allis-Chalmers Mfg. Co., Milwaukee, Wis.**

A 30 YEAR DREAM REALIZED

JERSEY COAST RESORTS NOW LINKED BY 40 MILE OCEAN DRIVE



Courtesy of Cape May County Times

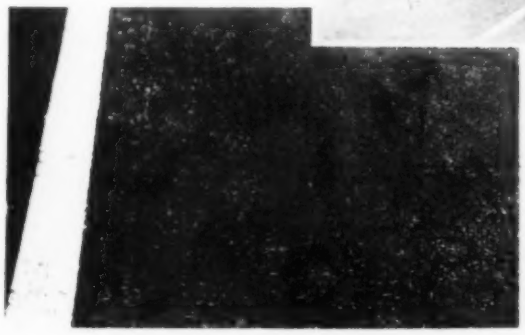
A 40-mile continuous highway, always within sight and sound of the ocean, now links the ten popular New Jersey coastal resorts from Atlantic City to Cape May. For 30 years, Cape May County has visualized such a highway. And the realization of that vision this year called for an expenditure of $1,700,000 and the construction of six bridges.

TEXACO Asphaltic Concrete paving predominates on the Ocean Drive. Half the entire length of the pleasant, scenic highway has been paved with this resilient, skidproof type of construction, representing two-thirds of the Drive's hard-surfaced mileage.

Cape May County officials estimate that the ten resorts served by the Ocean Drive will draw hundreds of thousands of motorists annually. The choice of TEXACO Asphaltic Concrete for the leading role in serving this intensive traffic is one more tribute to the durable, easy-riding qualities of this type of paving.

Half the 40-mile-long Ocean Drive, or two-thirds of the hard-surfaced portion, is paved with TEXACO Asphaltic Concrete.

New Jersey officials dedicated the newly completed Ocean Drive on June 13th.



Close-up of the skidproof, resilient TEXACO Asphaltic Concrete surface.

TEXACO ASPHALT

THE TEXAS COMPANY, Asphalt Sales Department,
135 East 42nd Street, New York City

Chicago
Kansas City
Houston
Jacksonville

Buffalo
Philadelphia
Richmond
Boston

. . . TODAY IT'S

SPEED

FOR

NATIONAL DEFENSE CONSTRUCTION

. . . . FASTER PILE DRIVING

necessary to meet time specifications

. . . . you can be dependably equipped with . . . . . .

SUPER-VULCAN OPEN TYPE

DIFFERENTIAL-ACTING

PILE HAMMERS

18C, 30C, 50C and 80C

"It hits a more effective blow"—"It drives a pile faster"—"It is easier on the boiler"—"Is considerably more economical" — "Certainly more durable" — "Far superior in driving ability" . . . expressions such as these show what users think of the Super-Vulcan. To you right now all this has a big meaning for here you have the right pile driving equipment for the new construction required in defense preparation.

Sizes 18C—30C—50C—80C meet all needs

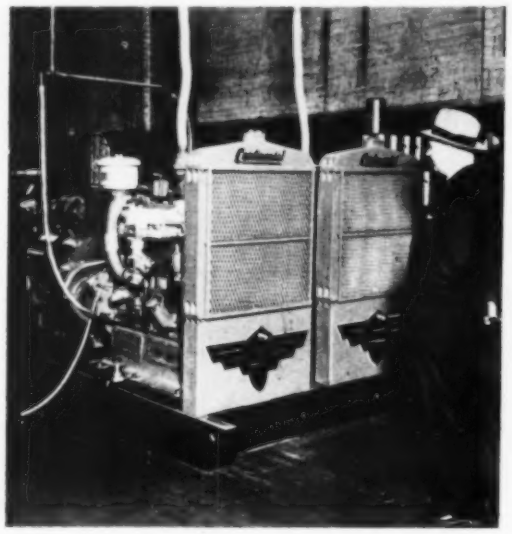
There is the right size to suit every pile driving condition — the Super-Vulcan drives more piles per dollar. Get all of the details on this greater pile driving speed and economy.

VULCAN IRON WORKS Since 1852

331 North Bell Avenue

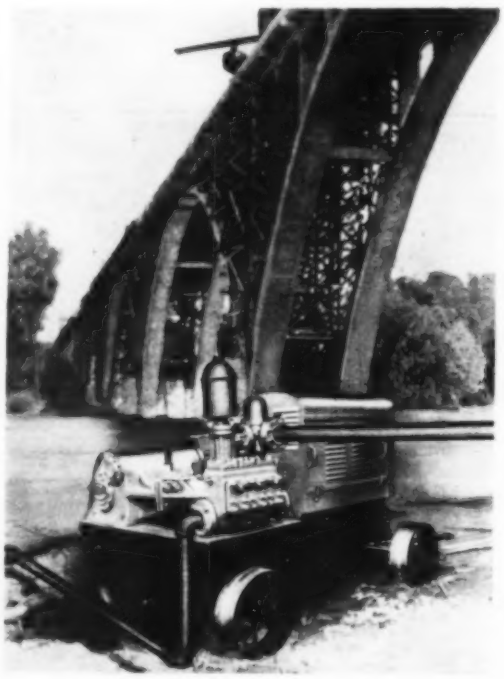
Chicago Illinois

ELECTRIC GENERATOR PLANT. 110-kw., 125-kva. capacity, is powered by two overhead valve-type engines which are said to provide unusually economical operation because actual load requirements control starting and stopping of these units. When load is within 50 per cent of peak, one engine is in operation; above this point, second engine automatically cuts in and picks up share of load. Engines arranged for operation on natural gas, but can also be supplied with straight gasoline carburetion. Drive from two engines is taken through individual automatic or free-wheeling clutches to silent chain transmission unit, from whence it passes through common take-off shaft to direct coupled generator. Two engines have total displacement of 1,002 cu.in. and together develop 200 hp. when operating at 1,500 r.p.m. At this engine speed generator operates at 1,200 r.p.m. Chain transmission allows either reduction or step-up in speed when required. If either engine needs adjustment or repairs, work can be done during valley load without interrupting electric service.—**Continental Motors Corp., Muskegon, Mich.**



★ ★ ★

ROAD PUMP redesigned to include following improvements (1) Unit has been streamlined with low center of gravity both for pump and power unit; (2) multiple silent roller chain power transmission; (3) two reductions from power unit to pump crankshaft, said to result in high pump efficiency; (4) herringbone gears in pump to give efficient transmission of power; (5) each cylinder and each set of valves has separate cover to allow inspection and repair by removing one plate only; (6) spacious tool box; (7) roller-bearing-equipped truck wheels, permitting easier portability—**Novo Engine Co., Lansing, Mich.**



BARBER-GREENE BUCKET LOADERS

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34 JOB PHOTOGRAPHS

The new Barber-Greene Bucket Loader Catalog 82 shows 34 photos of B-G Loaders saving time and money on different types of work including: truck loading from stock piles, road shoulder cleanup, top soil stripping, reclaiming, screening, loading scarified base, etc. Also specifications and accessories. Write for your copy.

Q-82

BARBER-GREENE

AURORA ILLINOIS

ARMSTRONG BROS.

CHAIN TONGS

You can show lower tool cost if you standardize on "ARMSTRONG BROS." Chain Tongs — for they are the finest tongs made. Drop forged jaws with milled teeth, hardened, tempered and tested for wearing qualities — large Hardened Steel Bolts, Alloy Steel Shackles, proof-tested Chains.

"IDEAL" CHAIN TONGS

Jaws drop forged from special high carbon steel with straight teeth for pipe and V-shaped teeth for fittings. Handles are drop forged spring steel selected for the required stiffness. Proof tested chains.

Write for Catalog C-39.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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Eastern Warehouse & Sales:

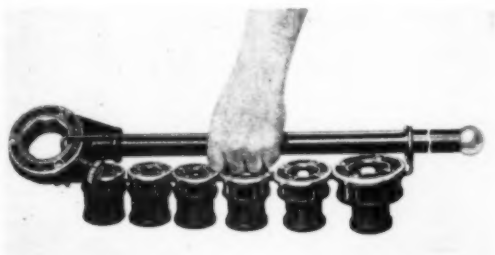
199 Lafayette Street, New York, N. Y.

PORTABLE OIL BURNING RIVET FORGE. said to heat 200 ¾x3-in. rivets per hour, is of all steel welded and riveted construction with top, sides and bottom of extra heavy plate and with lining of fire brick. Said to produce uniform, rotating heat and to light instantly. Burns fuel oil of 28-deg. Baume

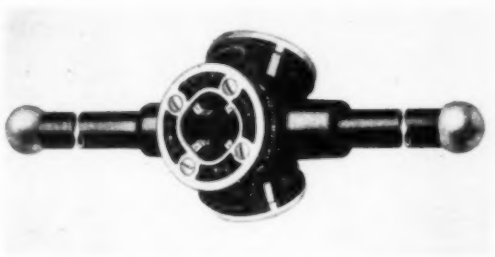
and lighter oils with compressed air from 30 to 120 lb. per square inch pressure. Patented furnace chamber designed to vent all spent gases which pass upward through top opening, eliminating air curtain and saving from 8 to 20 cu.ft. of compressed air per minute. Suction oil feed claimed to meet fire underwriters' and safety inspectors' requirements. Overall height, 27 in.; width, 20 in.; depth, 25 in. Oil tank capacity, 8 gal. Oil consumption, 1 gal. per hour. Air consumption, 4½ c.f.m. at 60 lb./sq.in. pressure. Net weight, 126 lb.—**Hauck Mfg. Co., 124-136 Tenth St., Brooklyn, N. Y.**

★ ★ ★

THREADERS FOR SMALL PIPE. ratchet and three-way models, have been added to line of Ridgid pipe tools. Nos. 00R, 0R and 11R are made of all-steel malleable alloy and thread ⅛- to 1¼-in.



pipe. Sets of semi-high-speed tool steel chaser dies are accurately cut and easily removed for regrinding. In No. 00R die heads are quickly locked in or removed by pull of ratchet, knob, and in Nos. 0R and 11R die heads push out easily for changing and snap into ratchet ring from either side. No special dies needed



for threading pipe close to wall; it is necessary only to turn dies upside down and shift to positions marked on die heads. Carrier which holds ratchet ring and set of dies is supplied with all complete sets. Three-way threaders have same features as ratchet threaders, are compact, have double ball-end handles and thread pipe from ⅜ to 1 in. — **Ridge Tool Co., Elyria, Ohio.**

"Here's a Testing Laboratory you can carry in ONE HAND"

The Most Economical and Practical Portable Field Testing Equipment Available

20 Tons of dependable, practical, *measured power* in one compact unit weighing only 57 lbs. 4-½" diameter gauge shows pressure exerted by jack. Complete, only $57.00 (East of Rockies.)

That's why dependable Blackhawk Hydraulic Jacks equipped with Gauges are so popular for "on-the-job testing." A few of the every-day uses are:

- **Testing breaking point of materials.**
- **Checking weights of large, cumbersome structural members.**
- **Pressing Plastics.**
- **Pressing parts together with cautionary, predetermined pressure.**
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- **Sinking piling to predetermined loads.**
- **Inspection of materials to pass specified load bearing standards.**
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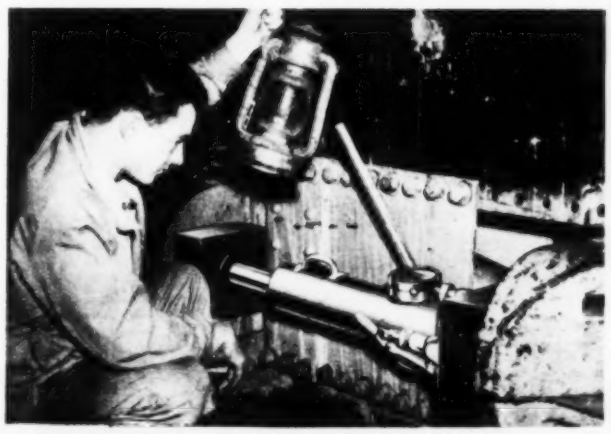
Get double service—use Blackhawk Jacks also for full range of lift, push, bend and spread jobs in addition to testing.



Drawing Bridge Anchor Cable — Blackhawk Gauge-Equipped Jacks were used in constructing world's largest pontoon bridge over Lake Washington, Seattle, Wash. Jack is shown in small cell beneath deck of pontoon. Pressure of jack exerts pull on cable assembly which is hooked onto pontoon anchors. When gauge registers required tension on cable — inspector issues approval.

Save Time, Money and Man-Power with BLACKHAWK Hydraulic Jacks

There's a size and type to meet every construction and engineering need — 1 to 75 tons. Blackhawk's complete line of hydraulic jacks includes Gauge Equipped models, regular Hand Jacks and remotely controlled all-directional Hydraulic Units. Send Coupon NOW!

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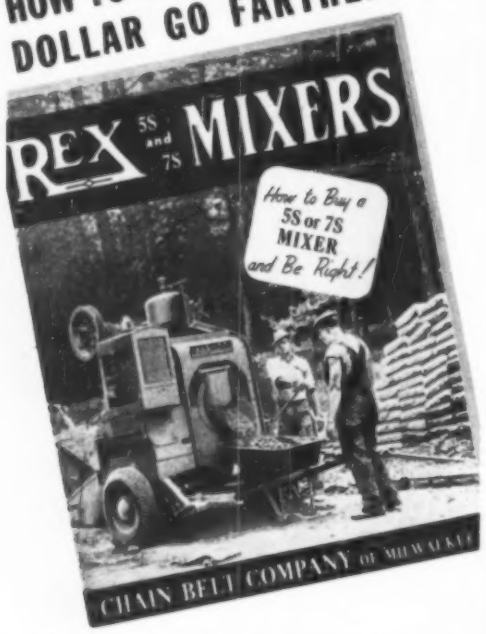
HOW TO MAKE YOUR 5-S MIXER DOLLAR GO FARTHER! . . .



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Even the most experienced contractor will find a lot of usable information in this book, including details on many important mixer design features which do not meet the eye at first glance. It tells the whole story of Rex design and construction and includes details on: the famous Rex Shimmy Skip; Rex non-diaphragming water tanks; Rex short-arc controls; Rex chain belt drive transmitting power in the "up direction." It completely describes the 1940 2- and 4-wheel Rex 5-S and 7-S Mixers.

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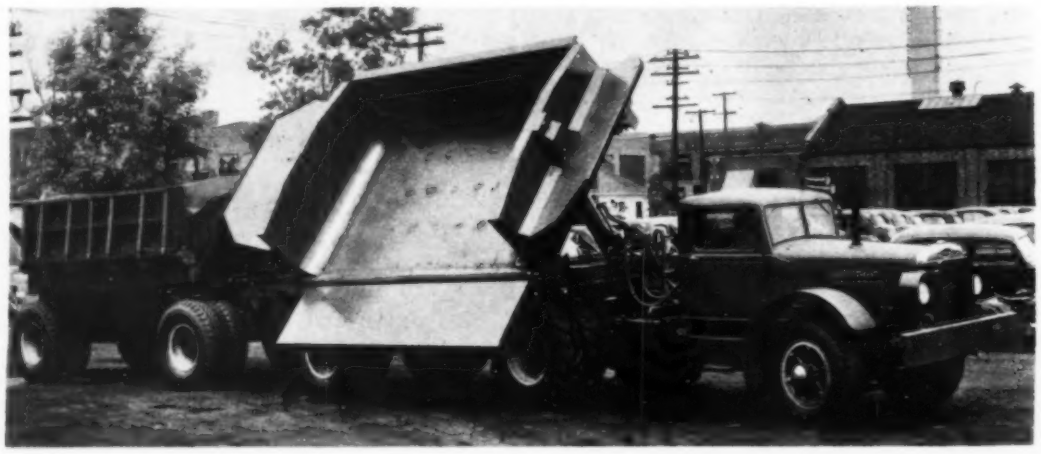
MIXERS

SELF-POWERED HYDRAULICALLY CONTROLLED SCRAPER. 10-cu.yd. capacity struck measure, has following features: (1) Concentration of load on large drive wheel tires to insure best of traction; (2) improved ratio of payload to gross load said to increase economy and efficiency; (3) complete selection of five speeds, forward and reverse, makes turning unnecessary and speeds up trip cycle; (4) when traveling upgrade in reverse, traction is said to be improved further by increase of weight on drive wheels;

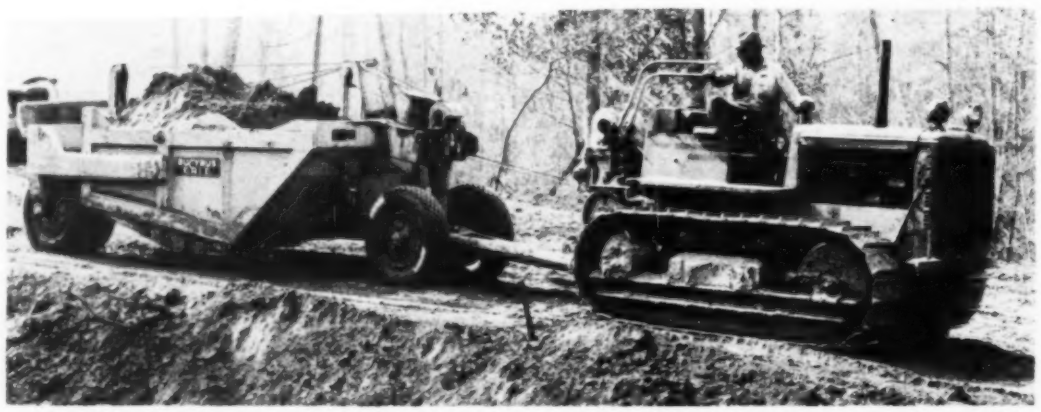
(5) unobstructed vision in all directions for operator; (6) front pusher plate and cushioned rear bumper block enable one unit to help another when necessary; (7) improved ejector said to assure quick, positive dumping and easily controlled spreading; (8) hydraulic system claimed to give quick accurate control of all movements with low upkeep cost. Powered by 100-hp. engine, gasoline or diesel. Speed range, 2 to 20 m.p.h. Dimensions: wheelbase, 15 ft. 10 in.; length, overall, 29 ft. 4 in.; width, 8 ft.; height, 8 ft. 3½ in.; cutting width, 8 ft.; clearance, steering axle, 19 in.; drive axle, 20 in. Drive wheel tires 18.00x24 in.; 20 ply standard; 21.00x24 in.; 20 ply optional.—**The Euclid Road Machinery Co., Cleveland, Ohio.**

★ ★ ★



TWO-WAY SIDE-DUMP TRAILER UNIT used for hauling rock out of quarry has body with water-level capacity of 12 cu.yd. Equipped with end-mounted side-dump hoists.—**Gar Wood Industries, Inc., Winch Division, Detroit, Mich.**

★ ★ ★



FOUR WHEEL SCRAPERS in complete range of sizes for use with International TracTracTors have five main parts. (1) frame with side-plates; (2) tilting bowl; (3) apron; (4) tongue assembly; and (5) rear axle assembly. Uses two-line cable control, one cable to control height of digging edge and other to regulate opening of apron and tilting of bowl. In dumping, bowl is tilted upward through an arc between side-plates of frame to an almost vertical position, giving positive, controlled, rolling ejection. Bowl consists of reinforced double-bottom plate curved below and behind earth and rotating between fixed side-plates of frame to which front edge of bowl is hinged by full length solid bar. As bowl rotates about this hinge in dumping, bottom lifts, thus ejecting material. Adhesion of material minimized by sharp dumping angle and scraping action against sideplates. Double-curve type cutting edge said to hold same angle at all times while digging and to produce boiling action which reduces to minimum tractor horsepower required for loading. Stability insured by wide wheel spread and low center of gravity. — **Bucyrus-Erie Co., South Milwaukee, Wis.**

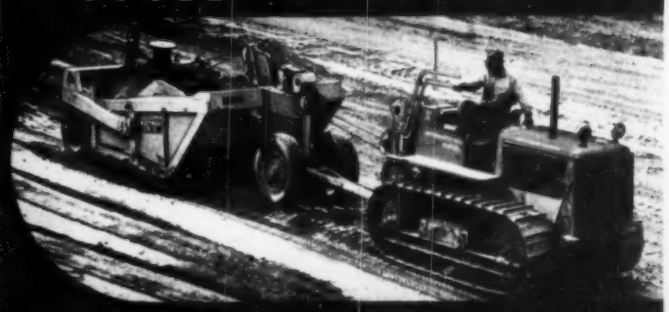
Build airports for DEFENSE the new LOW COST WAY

The smooth, accurate, finished work needed for airport construction is easy to get with a Bucyrus-Erie scraper. Two-line operation gives you positive independent control of the cutting edge so that you can hold an accurate grade in both cutting and spreading.

This scraper beats them all for finishing. With bowl held in raised position, it can be used as a substitute for a grader. Operator has full visibility so that he can see what he's doing and can hold the blade exactly where he wants it.

You'll like the smooth, finished work this scraper does. And you'll make money on the big output it gives you with its fast cycles.

HIGH SPEED CYCLE Built for speed, this scraper digs fast, hauls fast, dumps fast, and turns fast.



ACCURATE CONTROL With positive independent control of the cutting edge, you can hold a smooth accurate grade.

SMOOTH FINISHING With bowl in raised position, grade off high spots and fill in low ones, as with a grader.

LOW COST MAINTENANCE Simplest scraper on the market: has only 5 main parts. That means less trouble, less time out, less maintenance cost.

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BUCYRUS-ERIE BULLGRADER

It holds an accurate grade and has a blade that can be angled for side-casting. Use it for clearing and for moving stones, etc., out of way of scraper.

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SOUTH MILWAUKEE, WISCONSIN

JAEGER "HIGH DUMP" TRUCK MIXERS

Solve Your Placing Problems

INTO HOPPERS OR BIG BUCKETS

OVER DIRT PILES INTO THE FORMS

FASTEST LOADING, FASTEST MIXING AND FASTEST HIGH DISCHARGING TRUCK MIXER ON THE MARKET . . .

NEW DRUM SIZES BOOST PAYLOAD

Latest development by world's largest mixer manufacturer — mobile 2, 3 and 4 yd. concrete plants that cut placing costs, deliver proven higher strength concrete. One-Shot Top Loading, 2-Speed Mixing, Vacuum Controlled Discharge, many other features. GET CATALOG, PRICES, EASY TERMS.

HIGH DUMP MIXERS

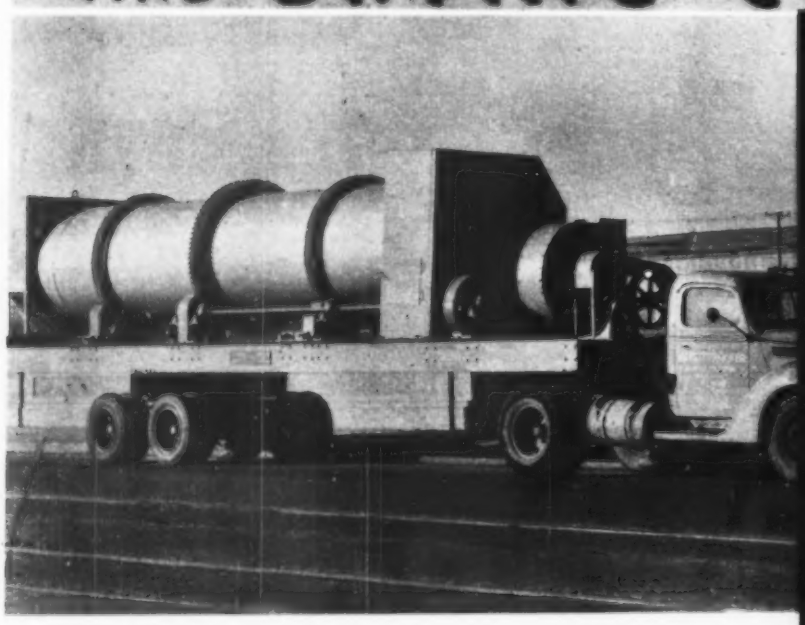
2, 3, 4 Cu. Yd. Sizes. 2 Yd. Size Mounts on Short Wheelbase Ford-Type Trucks

Also STANDARD HEAVY DUTY MIXERS

up to 5½ Cu. Yds. (7½ Cu. Yd. Agitators)

THE JAEGER MACHINE CO., 800 Dublin Ave., Columbus, Ohio

CUT MOVING AND DRYING COSTS



Semi-Trailer Mounting On This Large Capacity Dryer Insures Economical Moving and Set Up Cost Without Investment In Expensive Running Gear

Complete Portable And Stationary Plants In All SIZES

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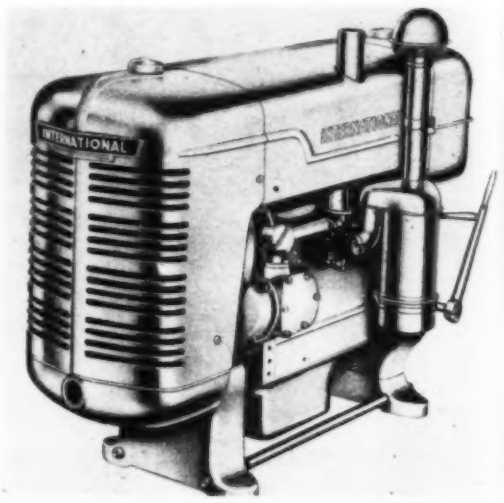
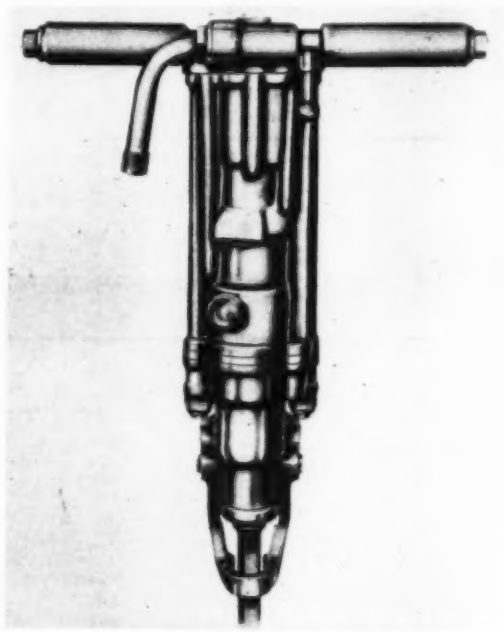
TWO NEW GASOLINE POWER UNITS. Models U-4 and U-6, offer following advantages: Valve-in-head design, replaceable cylinder sleeves, efficient combustion control, replaceable precision-type bearings, Tocco-hardened crankshafts, and satisfactory pressure lubrication. Model U-4 is 4 cylinder, 31.5 hp.



at governed speed of 1,800 r.p.m. with 3⅜x4¼-in. bore and stroke and has piston displacement of 152.1 cu.in. Its demensions are: 54¾ in. long; 23 7/16 in. wide; 40 in. high; weight, 920 lb. Model U-6 is 4 cylinder, 41 hp. at 1,500 r.p.m. with 3⅞x5¼-in. bore and stroke and piston displacement of 247.7 cu.in. Dimensions: 62 9/16 in. long; 25⅜ in. wide; 50¾ in. high; weight, 1,400 lb.—**International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.**

★ ★ ★

ROCK DRILL is 57-lb., 24-in. machine which drills to depth of 14 to 16 ft. and which is equipped with dual valve and cushion control. Dual valve controls air independently at each end of piston, that is, correct volume of air to give maximum striking power is admitted behind piston, valve is closed and piston is propelled by expansion of air. After



blow is delivered, air is admitted ahead of piston to give return stroke with strong rotating power. Premature admission of live air ahead of piston (which reduces force of blow) is awarded. Cushion control is said to give increased air efficiency, high drilling speed, low air consumption and ease of handling. Unit is equipped with shake-proof, five-position throttle handle, rubber cushioned steel puller and 4-hr. capacity oil reservoir. Provides full line-pressure hole blowing and is available in dry, blower or wet types (easily interchangeable) and with various chuck sizes and rotation speeds. Supplied with cradle and shell mountings, with rigid or sliding trunnion for 24- or 30-in. steel changes, or can be mounted on Featherweight automatic or motor feed wagon mountings for 4- or 6-ft. steel changes.—**Sullivan Machinery Co., Woodland Ave., Michigan City, Ind.**

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A warehouse near your job

Bethlehem has 15 reinforcing steel warehouses that serve all major construction areas. The warehouse nearest your contract supplies the steel at low shipping cost.

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BETHLEHEM STEEL

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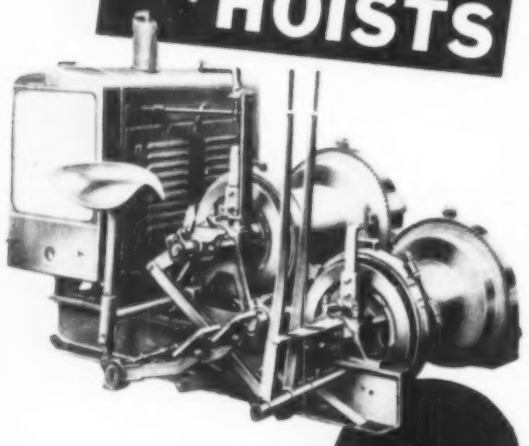
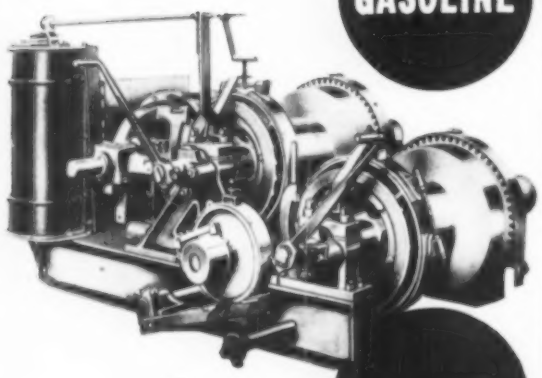
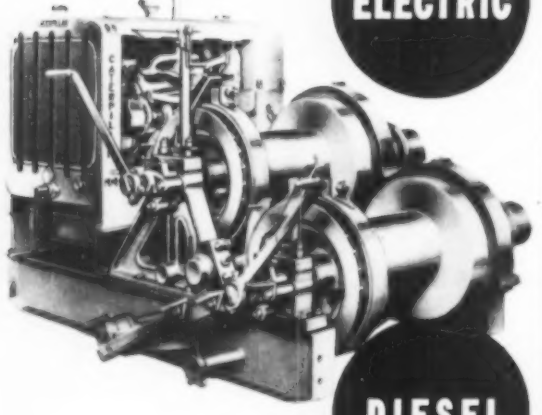
CLYDE · · · · · · HOISTS



GASOLINE



ELECTRIC



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No "one-job" machines of questionable durability when you buy Clydes, but high quality hoists that will give you safe and economical service for years and years to come.

Put a Clyde to work on your next job and profit from its low operating and maintenance costs.

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"You'll take pride in your Clyde"

CLYDE IRON WORKS, Inc.
DULUTH, MINN.

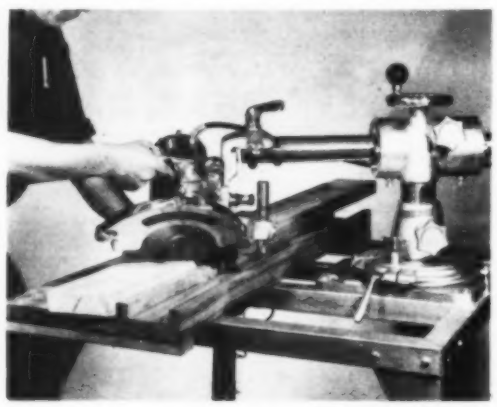
VOLUME DELIVERY FOOT GUN, low pressure, is adaptable to the following uses: (1) As auxiliary to stationary power gun; (2) as standard equipment for small fleets and service stations where stationary power gun is not available; (3) for use in field where power is not available; (4) for lubricating industrial equipment. Capacity 25 lb. Pumps approximately 1 cu.in. of grease per stroke. Maximum pressure when operated by hand, 3,000 lb.; by foot, 5,000 lb. Equipped with 7-ft. hose and delivers 1 oz. of lubricant to every three strokes. Weight, 39 lb. Height, 19 5/8 in. Portable with broad base for immediate positioning. Recommended especially by its makers for lubrication of trucks with big wheel bearing and universal joint capacity and gear boxes on large industrial equipment. — **Alemite Division, Stewart-Warner Co., 1826 W. Diversey Parkway, Chicago, Ill.**

★ ★ ★

PAVING BREAKER POINTS, or "Gads," made of specially selected steel are said to be designed to minimize wasteful, time-consuming breakage. They are not unbreakable, but because of unusual heat treatment, makers claim that they last longer than other types and require less sharpening.—**A. Young & Son, 2340 N. W. Nicolas St., Portland, Ore.**

★ ★ ★

RADIAL ARM AND SAW UNIT provides two complete sawing machines—portable electric hand saw and radial sawing machine. With it builder may perform all usual cutting operations and also handle duplicate cuts, some cabinet jobs, tenoning and routing, cutting tile, stone and other materials. When radial sawing machine is needed, shoe is removed from saw and motor unit mounted on radial arm which is then adjustable to cross-cut or rip at any angle or compound angle and set to cut any depth. Radial saw said to have several advantages: (1) Arm moves back clear of table and provides for stroke of 26 in.; (2) rip guide may be placed to rear so that stock 65 in. wide may be halved; (3) arm may be raised 7¼ in. by large wheel with handle actuating screw mounted on ball bearings and inclosed for protection against resin, pitch and sawdust; (4) arm may be swung right or left and locked securely by lever; (5) regular adapter permits tilting of unit 45 deg., special adapter, 90 deg.; (6) hold down and kick-back prevention device is built into adapter. Radial arm with wood work table is mounted on steel frame and stand to provide accurate and sturdy sawing unit.—**Porter-Cable Machine Co., Syracuse, N. Y.**



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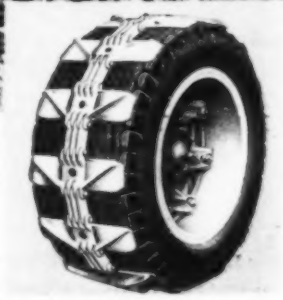
TOUGH
WARCO J & S TRACTION TREADS WILL PLOW THROUGH



In ice, snow, sand, loose ground or mud, your trucks will come through with a pay load if equipped with J & S Traction Treads.

Shoes bridge space between dual tires, forming a large bearing area in contact with ground, producing positive traction, limited only by the power of your engine.

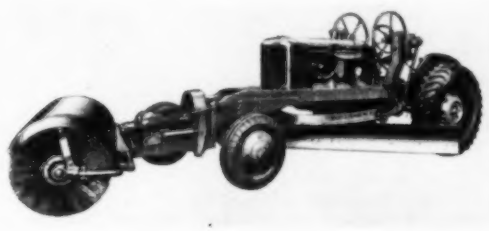
W. A. RIDDELL CORPORATION
BUCYRUS, OHIO

IMPROVED EXTENSION SPRAY GUN, supplied in lengths up to 12 ft. without use of scaffolding and staging, permits operator to stand on floor and paint average wall or ceiling. Gun has detach-

able gun grip control accommodating all lengths of shaft which turns in grip so that spray may be directed to any point. Useful for painting extensive surfaces such as railroad cars and ship hulls also for areas below level of operator.—**Eclipse Air Brush Co., 390 Park Ave., Newark, N. J.**

★ ★ ★

PATROL GRADER, powered by Allis-Chalmers Model W Grader, is now available with Hough front-end 6-ft. power broom unit said to enable it to perform additional maintenance duties which already include road grading, shaping of shoulders, ditch and bank cutting and grading, black top,

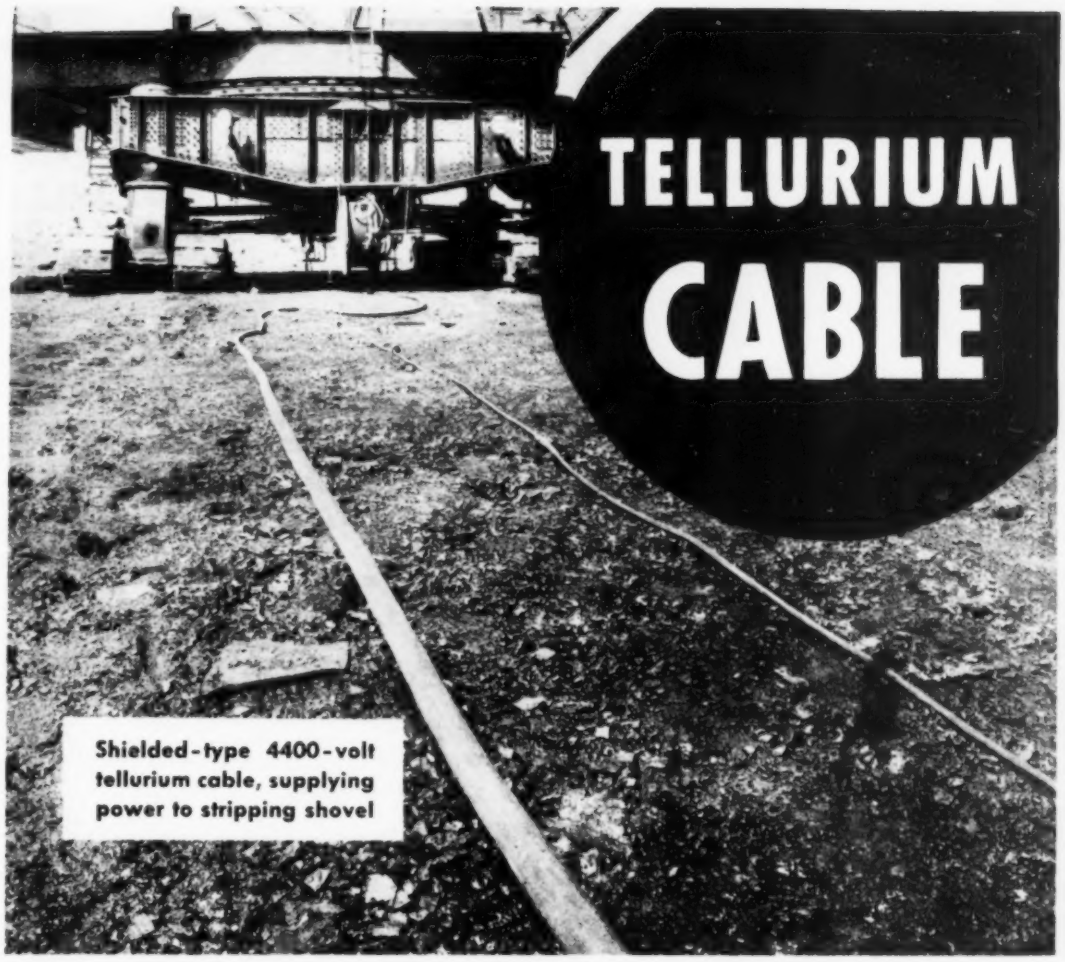


cutting, mixing and subgrade sweeping and snow removal. Blade which may be sloped or angled right or left is rigidly supported on turntable hung below tractor chassis. Broom has controlled ground pressure, sweeps one way and may be used simultaneously with blade when necessary Manufacturer claims durable construction, high efficiency, extended service life for brooms because of reversibility, positive power application through cut gear transmission and all operations easily controlled from one platform.—**Frank G. Hough Co., Libertyville, Ill.**

★ ★ ★

LIGHTWEIGHT, WEATHERPROOF FLOODLIGHTS, two models, for general use in business and industry employs one-piece reflector, to which is attached an extruded aluminum socket housing, thus providing rigid and sturdy construction. Lens held in place by metal retainer ring. Assembly mounted

on cast aluminum mounting bracket allowing horizontal adjustment through 360 deg. and vertical adjustment through 135 deg. Either flat or "ground spike" base available. One model is 8 in. in diameter and employs 100-watt lamp; other 10 in. in diameter with 200-watt lamp. Both may be obtained with either plain or spread beam light distribution and with plain or colored lenses. Standard colors, red, green, amber and blue. — **Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.**



One Company a Steady User for 8 YEARS

EIGHT years ago we supplied an Indiana colliery* with some tellurium-rubber cable for electric shovels. Its performance over a long period proved its toughness. As a result, that coal-mining company has been using tellurium cable ever since. Many other mine owners have also discovered that tellurium cable saves money by cutting down on replacements, repairs, and costly holdups.

In detail this cable has been improved through the years, but essentially the design is one that has always given satisfactory service. It's tough, hard to cut, and stands up under rough usage.

Next time you need portable electric cable for shovels, cutters, loaders, drills, or motors, use tellurium-rubber and save money. Most sizes can be supplied by your jobber from stock. Or, to make absolutely sure of the right type and size for your particular job, call a cable specialist at the nearest G-E Office. General Electric Company, Schenectady, N. Y.

**Name on request*

GENERAL ELECTRIC
INSULATED CABLE
ALWAYS
THE RIGHT TYPE
FOR EACH JOB

GENERAL ELECTRIC

"STEM" AND TAMP *right*

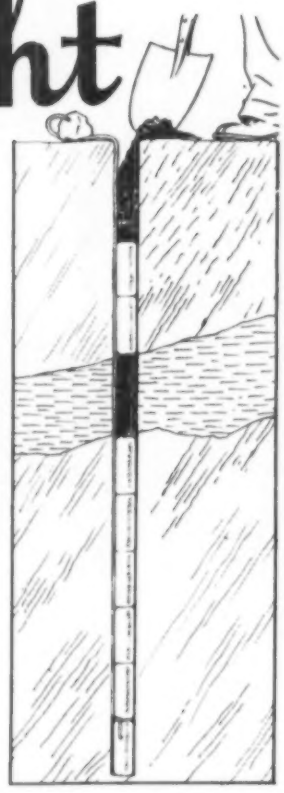


Illustration shows a typical deckload, with explosive charge located in the rock and stemming material in the soft strata. Notice that the Primacord is in contact with each cartridge in both loads —no detonators are needed.

Any explosive does its best work when strongly confined. Stemming material should be free from stones or sharp particles. For deep well-drill holes, dry free-running sand is generally satisfactory. Moist sand, loam, or clay is recommended for shallow vertical holes, jackhammer holes and holes in the face.

In loading well-drill holes, the Primacord should be cut off the spool and secured with a stone at the mouth of the hole. If stemming material is shoveled into the mouth of the bore hole, be careful not to cut the Primacord with the shovel!

For small holes, the tamping stick should be of wood, with a flat end. Just enough force should be used to press the stemming material firmly into the hole.

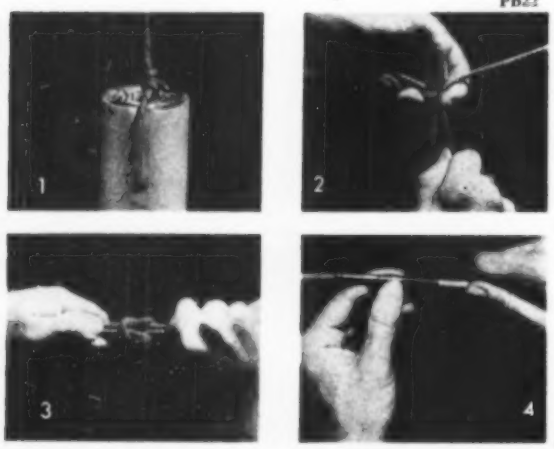
Send for the Primacord Booklet — it's free.

THE ENSIGN-BICKFORD CO., Simsbury, Conn.

Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse since 1836

PRIMACORD-BICKFORD *Detonating* FUSE

PB22



1. Tie through cartridge.
2. Half hitch branch to main line.
3. Connect main line lengths with square knot.
4. Fuse and cap on end of main line.

Important: Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.

NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use

ELECTRIC HAND SAW MANUAL—**Porter-Cable Machine Co.,** Syracuse, N. Y. (22 pp., illustrated.) Helpful suggestions for contractors and builders on technique of using electric hand saw to get best results. Value of setting up good saw bench and using radial arm attachment for precision cuts to pattern. Notes on miter and bevel cuts. Advice on use of electric current. Useful estimating data includes man-hours of work required per 1,000 ft. b.m. on form work for concrete, girders, sills, joists, ceiling beams, rafters, etc. Time and money-saving ideas cover use of pattern, cutting two or more pieces simultaneously, vertical and horizontal cuts, sizing rough-sawed stock, openings, and cutting heavy stock. Special notes on roofing involving bevel cuts. Instructions on proper care of saw blades.

★ ★ ★

GASOLINE HOISTS — **Lidgerwood Mfg. Co.,** Elizabeth, N. J. (16 pp., illustrated) Complete line of gasoline-motor driven hoists of single, double and three friction-drum types rated at from 30 to 150 hp. Details of automatic mechanical brake, lubrication, frictions and silent chain drive. Hoisting speeds from 175 to 300 ft. per min. Three-drum hoists for derrick work with a two-line grab bucket. High-speed material hoists in eight sizes with hoisting speeds from 425 to 650 ft. per minute. Gasoline drag scraper hoists.

★ ★ ★

GYPSUM PLASTER—**The Celotex Corp.,** 919 N. Michigan Ave., Chicago, Ill. (72 pp., illustrated.) Answers common questions of plastering contractors, architects and craftsmen that arise in connection with plaster and plastering, and covers subject of gypsum from mine to finished plastered wall. Varieties of gypsum plaster, their uses and the precautions necessary in their use occupy a large part of this handbook. Possible causes for trouble are considered and simple precautions outlined. Where a remedy is possible, it is described in full. In addition, mixing and application directions are given in detail together with easy-to-understand reasons why certain steps must be taken to insure good results. Plaster bases are also discussed and the merits and faults of each presented.

★ ★ ★

STEEL SAFETY TOE BOOTS — **Lehigh Safety Shoe Co., Inc.,** Allentown, Pa. (8 pp., illustrated.) Explains safety shoe features and construction of rubber boots and shoes and tells which should be specified for longest wear and maximum foot protection under various industrial conditions. Describes and illustrates more than 60 different styles of leather and rubber safety footwear. Steel toe box protects men's feet and anti-skid soles prevent slips and falls. Leather insole minimizes "burn" from all-day wear.

★ ★ ★

STEEL VALVES — **Hancock Valve Div., Manning, Maxwell & Moore, Inc.,** Bridgeport, Conn. (40 pp., illustrated.) Contains complete dimensions of all types of valves and also material specifications of all metals used in valves. Reproduces in full A.S.M.E. service rating tables. Also includes information on Hancock Duravalve and Bar Stock Valve. Gives rules for determining how to select proper valve for specific type of service.

TRUCK BODIES, WINCHES, ROAD MACHINERY — **Gar Wood Industries, Inc.,** Detroit, Mich. (8 pp. illustrated.) Covers wide ranges of motor truck end-dump and side-dump bodies and tank bodies. Also winch equipment for hoisting, hauling and handling uses. Road machinery units include two- and four-wheel scrapers, sheepsfoot tamping rollers and bulldozers.

★ ★ ★

METAL SPRAY GUN—**Master Metal Spray, Inc.,** 2527 Magnolia St., Oakland, Calif. (4 pp., illustrated.) New speedmaster unit, using compressed air, oxygen and acetylene, rebuilds or replaces worn machine elements, such as shafts, cylinders and rods by spraying on atomized metal as part is rotated in lathe. Any metal in wire form (usually $\frac{1}{8}$-in diameter) may be fed into gun automatically. Nozzle of special alloy is non-clogging. Weight of gun is 47 lb.

★ ★ ★

WIRE ROPE CLIPS—**American Hoist and Derrick Co.,** St. Paul, Minn., (32 pp., illustrated.) Describes and illustrates with many job photographs wide range of applications of Crosby drop-forged steel clips for fastening wire rope in every kind of service, from guy ropes to heaviest hoisting operations. Practical advice is offered to riggers on the right way to put on wire rope clips to insure safety, including a list of five wire rope fastening safety rules. Table of sizes (from $\frac{1}{8}$ to 4 in.) prices and weights of clips.

★ ★ ★

GYPSUM PARTITION TILE AND FIREPROOFING — **Gypsum Association,** 211 West Wacker Drive, Chicago, Ill. (22 pp., illustrated.) The first part of this publication covers partitions, the second part fireproofing, and the last five pages are devoted to specifications for gypsum fireproofing and for the erection of gypsum partition tile. Detailed drawings are included to show proper method of erecting gypsum tile partitions and of fireproofing columns, beams and girders with gypsum fireproofing.

★ ★ ★

BENDERS FOR TUBES—**Parker Appliance Co.,** 17,325 Euclid Ave., Cleveland, Ohio (34 pp., illustrated.) Power-tube benders in several sizes and models. No. 848 for copper, aluminum or light-gage steel tubing of from $\frac{1}{2}$ to 3 in. O. D. makes 180-deg. bend in 12 sec. Operated by 3-hp. electric motor. Dial indicator shows angle of bend. Other models include benders manually operated by means of ratchet handles. Booklet includes price lists of benders and accessories as well as operating instructions for producing perfect bends. Notes on correct flaring of tubes for making joints.

★ ★ ★

PREFORMED WIRE ROPE—**American Chain & Cable Co.,** Wilkes-Barre, Pa. (12 pp., illustrated.) Recommendations for obtaining maximum performance from wire rope on road-building equipment, with notes on advantages of preformed type of cable. Contains specific suggestions for hoist lines, boom lines, trip cables, thrust and crowding lines, swing lines, holding and closing lines and other operating cables on variety of equipment, including power shovels, cranes, draglines, scrapers, concrete mixers, derricks and ditchers. Tables give strengths, weights and prices of commonly used sizes of wire rope.

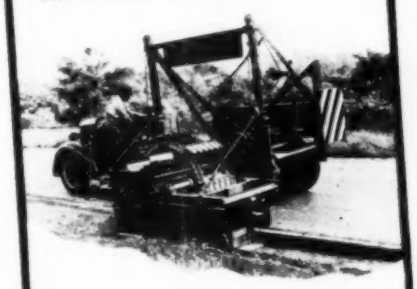
★ ★ ★

MIXER FOR ROAD STABILIZATION — **Seaman Motors,** Milwaukee, Wis. (4 pp., illustrated.) Gives specifications and uses of Pulvi-Mixer, mechanical mixing unit drawn by tractor and driven by power takeoff which rotates transverse shaft carrying spring tines mounted on double torsion springs. Made in sizes 3 to 12 ft. in width and equipped with twelve revolving tines per foot, machine pulverizes soil and speeds mixing operations on stabilization projects involving sand-clay, clay-gravel portland cement, bituminous materials, calcium chloride and sodium chloride. Also used to loosen fills before sheepsfoot tamping.

Look what an R.B. FINEGRADER *will do for you!*

One pass and the grade is RIGHT TO SPECIFICATIONS!

ANOTHER COST CUTTER



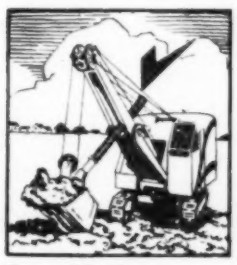
THE BUCKEYE ROAD WIDENER

For digging subgrade trench at the rate of a mile or more a day. One man operated, it speeds up operations and saves money. Built in two sizes to dig trench up to 48" wide in one cut. Write for literature now.

LOOK at the illustrations above — they show how an R. B. Finegrader cuts into a roughly prepared subgrade and leaves it **right on the payline** ready for the paving crew! This machine prepares the grade at a cost way below trial and error hand methods and leaves it right to specifications so that you don't put in extra concrete to fill up low spots — it puts material where you want it on the shoulders and it moves fast — always way out ahead of the paver. For concrete or waterbound macadam roads — any width — any kind of soil — you'll find the R. B. Finegrader is a profit-making machine. It eliminates the bottleneck in an otherwise completely mechanized job. Plan now to modernize your grade building methods. Write for descriptive catalog on the R. B. Finegrader today.

BUCKEYE TRACTION DITCHER CO.
Findlay • Ohio

BUILT BY Buckeye

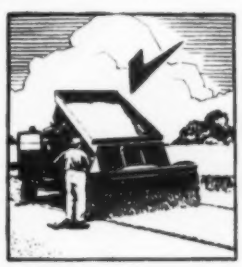

Convertible Shovels....

Trenchers . . . .

Tractor Equipment. . .

R. B. Finegraders. . .

Road Wideners. . .


Spreaders . . .

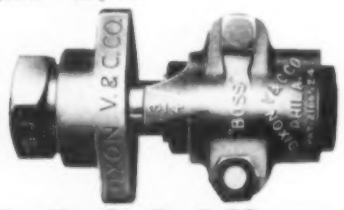
Four Ways to Keep Your Air Jobs Moving FAST!

"DIXON" AIR HAMMER COUPLINGS

Second to none in providing dependable, low cost service! Simple construction — strong and durable — quickly, easily installed. Cadmium plated — rustproof. Compact type, Style WLD-7, ½" and ¾"; heavy type, Style WHD-9, ¾" and 1".

"GJ-DIXON" GROUND JOINT AIR HAMMER COUPLINGS

Ground Joint feature insures safe, trouble-free service with minimum maintenance expense. No leaking or lost washers to replace. Copper insert in spud fits rounded head of steel stem, forming soft-to-hard metal seal that *will not leak*. Compact type, Style XLD-41, ½" and ¾"; heavy type Style XHD-52, ¾" and 1". Cadmium plated — rustproof.



"GJ-BOSS" GROUND JOINT AIR HAMMER COUPLINGS

Same as "GJ-DIXON" except that it is equipped to withstand extreme pressures and roughest handling by application of strong, malleable iron "BOSS" Clamp. No possibility of leaks or blow-offs. Compact type, Style XLB-61, ½" and ¾"; heavy type, Style XHB-72, ¾" and 1".

"BOSS" AIR HAMMER COUPLINGS

Same general design and construction as "DIXON" Air Hammer Couplings but, like the "GJ-BOSS", they provide the extra strength and safety insured through application of the sturdy, malleable iron "BOSS" Clamp. Cadmium plated — rust-proof. Compact type, Style WLB-21, ½" and ¾"; heavy type, Style WHB-32, ¾" and 1".

Stocked by leading rubber manufacturers and jobbers

DIXON VALVE & COUPLING CO.

MAIN OFFICE AND FACTORY: PHILADELPHIA, PA.

Branches: Chicago — Birmingham — Los Angeles — Houston

COMPOSITE CONSTRUCTION FOR BRIDGES—**Porete Mfg. Co.,** North Arlington, N. J. (26 pp., illustrated.) Explains alpha system of steel and reinforced concrete construction for bridges. Steel spiral reinforcement welded to beam anchors concrete floor slab, insuring their action as a unit by perfect bond between concrete and steel. Steel beam takes care of tensile stresses and concrete provides for compressive stresses. This design is claimed to be suitable for all structures where depth is limited, such as grade-crossing eliminations. Design data, reports on tests and descriptions of bridges built by this system.

★ ★ ★

ROCK DRILL ACCESSORIES—**Ingersoll-Rand Co.,** Phillipsburg, N. J. (12 pp. illustrated.) This booklet illustrates and furnishes data on the many accessories necessary to efficient rock drilling. These include such items as hose and couplings, air filters, grinders, steel cutters, air-line lubricators and rock-drill mountings. Also covered are moil points, chisels and spades for breaking concrete, cutting asphalt, tamping and digging.

★ ★ ★

HYDRAULIC JACKS AND PIPE BENDERS—**Blackhawk Manufacturing Co.,** Milwaukee, Wis. (36 pp., illustrated.) Covers wide range of sizes and types of hydraulic jacks and pipe benders, varying in capacities from 1 to 75 tons. These tools are designed for speeding up plant change-overs, maintenance, production and construction operations. Photographs illustrate numerous applications of jacks and benders. Products include hydraulic hand jacks; gage-equipped jacks; wheeled floor jacks; high-pressure valves; remote controlled jacks, both hand-operated and motor-driven, hydraulic tools for maintenance and production; and hydraulic pipe and conduit benders.

★ ★ ★

CALKING GUNS—**Kenmar Manufacturing Co.,** Albert and Martha Sts., Philadelphia, Pa. (4-p. leaflet, illustrated.) Complete line of calking, glazing and grease pressure guns, with price lists. Various types of nozzles are illustrated for pointing masonry, glazing and calking.

★ ★ ★

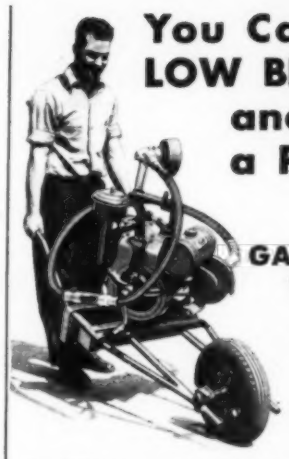
EXCAVATING MACHINERY — **Bucyrus-Erie Co.,** South Milwaukee, Wis. (76 pp., 3¾x6¾-in. size, illustrated.) Brief descriptions of machines, such as power shovels, cranes and draglines, included in Bucyrus-Erie line, with suggestions on selecting size and type of equipment best suited to individual problems of excavating and material handling. Power shovel sizes range from ⅜ to 33 cu.yd. Other equipment includes tower excavators for levee-building, tunnel mucking shovels, dredges, walking draglines, wheel scrapers, bulldozers blast-hole drills. Booklet contains tables of condensed specifications for all equipment described.

★ ★ ★

SMALL TOOLS — **Forsberg Manufacturing Co.,** Bridgeport, Conn. (66 pp., illustrated.) Covers line of Whale and Viking brand small tools and accessories, including hack saw blades of special alloy steels for both hand and power use, metal band saws, hack saw frames, composition mallets and hammers, screwdrivers, hand and breast drills, putty knives and scrapers.

★ ★ ★

SLOW-CURING ASPHALTS—**The Asphalt Institute,** 801 Second Ave., New York, N.Y. (4 pp.). Supplementing recently issued revised specifications for cut-back asphalts, folder describes new specifications intended to supersede all earlier specifications for type SC (slow-curing) materials. Revised specifications, as a whole, develop in detail a new system of viscosity limits defining six grades each of RC (rapid-curing), MC (medium-curing) and SC (slow-curing) products.; the system is designed to obtain greater continuity in viscosity gradations and to eliminate overlapping between adjacent grades.



The MALL power unit equipped for concrete surfacing. It can also be used for *VIBRATING, SANDING, PUMPING, SAWING, GRINDING AND DRILLING.*

You Can Beat the LOW BID PROBLEM and Still Make a PROFIT with Mall GASOLINE POWERED VIBRATORS

SLASH TIME, LABOR, CEMENT AND POWER COSTS!

Here's the fast, economical and efficient, low priced MALL concrete vibrator that is enabling contractors to write business-getting bids for all types of concrete construction. It operates all day on 1½ to 2 gallons of gasoline — reduces labor costs — eliminates honeycombs and voids and expensive hand patching after forms are removed. In addition, it makes it possible to use coarser aggregates.

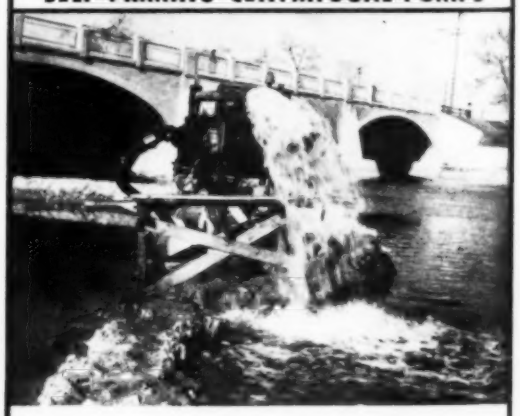
The flexible shaft transmits the power to the MALL exclusive patented off-balance lead weight vibrating unit which delivers the maximum vibration to the actual job of placing concrete.

Write TODAY for FREE demonstration and complete information.

MALL TOOL COMPANY
7757 SOUTH CHICAGO AVENUE CHICAGO ILLINOIS

C.H.&E.

SELF-PRIMING CENTRIFUGAL PUMPS



- **FAST PRIMING**
- **HIGH EFFICIENCY**
- **ECONOMICAL OPERATION**
- **TRASH TYPE IMPELLERS**
- **ROLLER BEARINGS**
- **11 SIZES**
- **3,000 TO 200,000 G.P.H.**

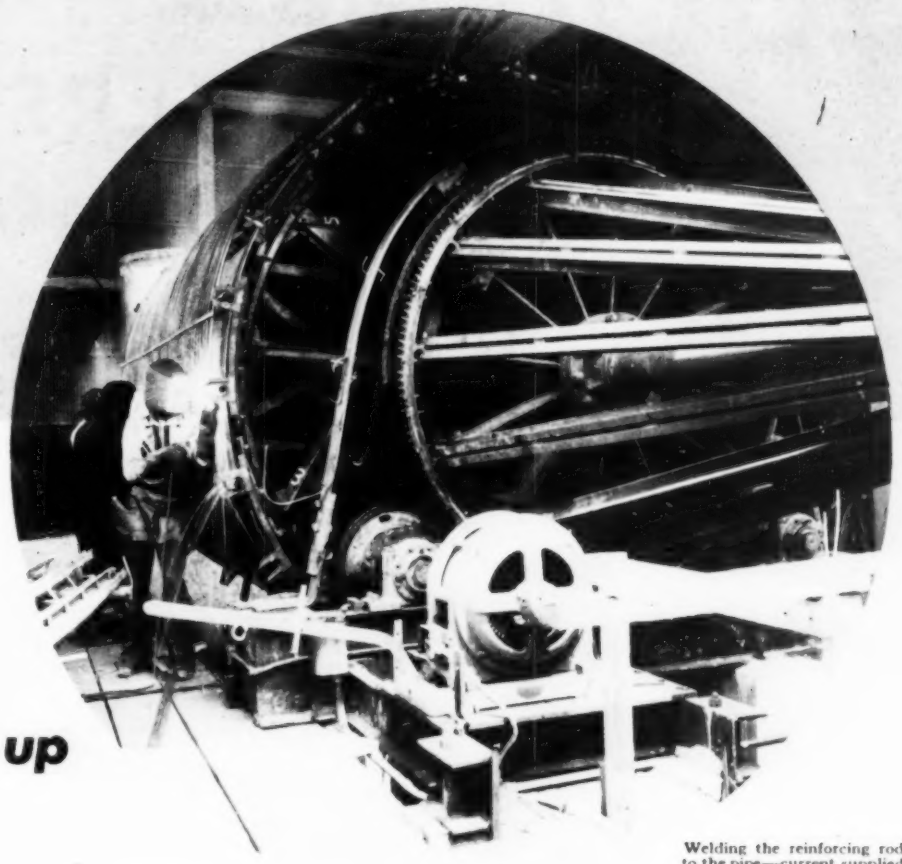
Send For Bulletin SPP-40

A COMPLETE LINE OF PUMPS • SAWRIGS HOISTS • MORTAR MIXERS • SMALL ROLLERS BAR CUTTERS AND BENDERS

C. H. & E. MANUFACTURING CO.
3847 N. Palmer St., Milwaukee, Wis.

WELDING BOSTON'S HIGH-PRESSURE PIPELINE— *ON TIME!*

Because delays meant dollars— contractor put it up to G-E welders



Welding the reinforcing rod to the pipe—current supplied by G-E 200-amp welder. The drum is driven by a G-E 20 H-P motor.

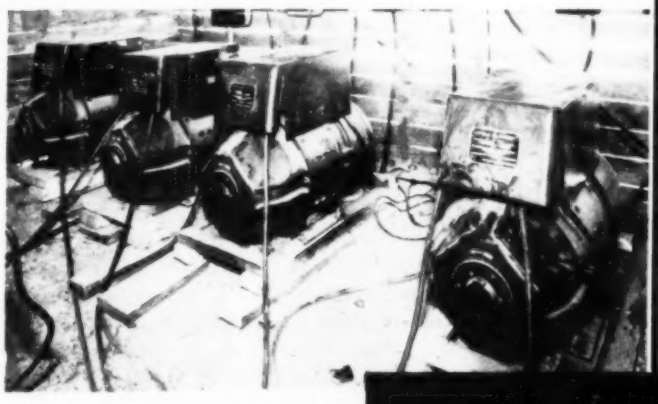
THE enormous new high-pressure aqueduct which will carry 300,000,000 gallons of water a day to Boston's Metropolitan Water District is the largest precast, concrete-covered steel pipe in the world. To avoid breakdowns and costly delays in the welding of the 14½ miles of this pipe, the contractor replaced existing equipment with new G-E welders. With these he speeded up the work and easily put in welds which stood the rigorous hydrostatic-test pressures.

G-E welders have two essential electrical characteristics which help to save time and money:

(1) Instant-recovery voltage always exceeds the arc voltage. This makes possible easy striking and maintenance of the arc and prevents time-wasting arc popouts.

(2) Current peaks are limited to two and one-half to three times steady short-circuit current. This makes possible quick striking of the arc and efficient deposition of metal. It also avoids excessive weld spatter, sluggishness, and sticking of the electrode.

These two features have meant savings to hundreds of contractors doing all types of jobs — both new work and repairs. Cash in on them — get in touch with the nearest G-E office or G-E welding distributor. You'll get the right equipment correctly applied to your job. General Electric, Schenectady, N. Y.



Four of the 20 G-E arc welders used on the Boston Metropolitan Water District, high-pressure aqueduct.

SIX REASONS WHY
You'll Do a Better Job with G-E All-position Electrodes

1. They maintain a strong arc in severe wind and bad weather.
2. They're safe, and easy to handle.
3. Their high dielectric strength prevents short-circuiting or arcing.
4. They permit rapid escape of gas and quick freezing of deposited metal and slag. This helps develop welds of better penetration and contour.
5. They give clean welds with minimum spatter.
6. They have authoritative approval for construction applications.

For complete information on why G-E electrodes will enable you to get faster, less expensive welding, write for Bulletin GEA-1546F.

655-12A

GENERAL ELECTRIC

Smoother Hydraulic Operation with BAKERS

BULLDOZERS

Earth movers choose Baker Bulldozers and Gradebuilders because they can be depended upon. Reliable performance and freedom from major operating delays provide the efficiency you must have to finish jobs on time.

In the new series of Baker Bulldozers now available, you will find even better hydraulic control, sturdier construction and finer balance. Bakers are still far ahead — and better suited for your toughest jobs.

With the two types of Baker Bulldozers — with straight and curved blades — you can do a wider variety of work. Bulldozer moldboards are interchangeable with each other as well as with Gradebuilder moldboards.

SCRAPERS

Baker Scrapers dig full capacity loads with less effort and power than you would think possible. The flat digging angle makes it easy to fill the bowl. The constant digging angle assures you smooth grades. And clean dumping and even spreading give you neat, level fills.

Baker Hydraulic Scrapers are built in 3 sizes, all two-wheel — 3, 4 and 6 cu. yd. capacities, with hydraulic system for any tractor.

Send for Bulletins on Baker Scrapers, Bulldozers and Other Baker Products

THE BAKER MANUFACTURING CO.

568 Stanford Avenue, Springfield, Illinois

• BAKER TRACTOR EQUIPMENT •

BULLDOZERS • GRADEBUILDERS • SCRAPERS • ROOTERS • ROAD DISCS • MAINTAINERS • SNOW PLOWS

RATCHET LEVER AND CHAIN HOISTS — **Coffing Hoist Co.,** Danville, Ill. (19 pp., illustrated.) Design features and applications of Safety-Pull ratchet lever hoists, in which load is always locked by sprocket and ratchet pawls. Cadmium plated roller chain. Capacities from ¾ to 15 tons; weights from 14 to 150 lb. New tool is Lite Line Puller for telephone and light wires. Power Master chain hoist, with capacities from 1 to 8 tons, has lowering speed controlled by governors. Also line of new spur-geared differential chain hoists of 1 to 3 tons capacity and several models of electric hoists.

★ ★ ★

SPRAY PAINTING EQUIPMENT—**Eclipse Air Brush Co.,** 390 Park Ave., Newark, N. J. (32 pp., illustrated.) Covers complete line of spray equipment for both manual and automatic operation. Included in the catalog is a section devoted to Pneumix air-motored agitators.

★ ★ ★

MELTING KETTLES—**Hauck Mfg. Co.,** 124-136 Tenth St., Brooklyn, N. Y. (8 pp. illustrated.) Describes and illustrates "Speed-Master" melting kettle for tar, asphalt or pitch with "kwiklean" feature—removal of clean-out door—said to make cleaning easy without removing heating tubes. In addition to melting kettles, catalog covers new combination skid and trailer kettle; barrel hoist; kettle thermometer; both hand and power spray attachments. Also Speed-Master gas-fired kettle using petroleum gas in cylinders.

★ ★ ★

Wood Panel Forms FOR BUILDING CONCRETE DAMS

(Continued from page 63)

assistance of the foreman in charge of work under observation can be of great value. If a foreman fully understands that such studies are for the purpose of obtaining information as to the most efficient method of doing work and of discovering those items which unnecessarily add to costs, but not for the purpose of discrediting any particular gang or individual, his cooperation is assured. Foremen, by virtue of their familiarity with local job conditions and their experience on similar operations on other projects, are capable of making many valuable suggestions toward obtaining economical costs.

Time Study Methods

Time studies should include the cost in man-hours and in money on each of the several steps which go to make up the complete operation that is under observation. All delays must be clearly set forth, as frequently they make up an all-too-large item of time consumption and expense.

For example, if a study is being made of the complete item of Panel Form Costs, the following items, among others, will serve to indicate the types of items to be studied completely:

(1) Panel form fabrication
(2) Moving panels to site
(3) Hoisting panels into position

(Continued on page 92)

WHETHER it's an old-fashioned horse or modern horsepower you're trying to save, your best bet is prevention—foresight.

But while the same principle covers both . . . it takes much more foresight to guard the horsepower of industry's speeding machines from the thief known as Friction. *More* foresight—and a far more specialized kind.

Shell men *have* foresight, gained by years of experience in cutting the cost of friction. They work always in close touch with both the designers of machines and the operators of machines . . . in the power plant, the coal mine, the machine shop, the paper mill, to name but a few.

And always their aim is twofold: To determine the lubricant that gives most efficient operation for each machine *today*. To anticipate what changes in lubricants will be demanded by the machines of *tomorrow*.

The wealth of firsthand experience, the foresight and skill these Shell men have thus gained, is on call at any time, in any place where you need it. Call in your Shell man today—let him make a careful study of your machines on the job and help you keep the padlock on your horsepower.

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. . . *Says One Owner*

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MARMON-HERRINGTON COMPANY, INC.
INDIANAPOLIS, INDIANA, U.S.A.

(Continued from page 90)

(4) Lining up panels
(5) Placing anchor rods, form ties, etc.
(6) Smoothing up panels before pouring
(7) Watching forms during pours
(8) Removal and repairs

Other subdivisions will present themselves on further study. Each of these groups will be further subdivided into minor details which make up the item. The man-hour and labor cost of each of the several items should be ascertained and reduced to a unit, and the total of all these units should check with the total as shown on the payroll distribution for the work under observation.

Complete and accurate information must be kept of all items which have any effect on unit costs. Some of the items, likely to affect unit costs, are more fully described in a later paragraph. In general, the following items should be noted in addition to the man-hour and cost data:

(1) Date
(2) Weather
(3) Location
(4) Foreman in charge
(5) Number and classification of laborers
(6) Period covered

Studies should be complete for the period covered, and the notes should include and check with both the payroll amount and the quantity estimates for the period. The responsibility for checking the time studies with the payroll and quantity estimate rests with the person making the time study. It is not sufficient simply to explain differences in general terms. If such differences exist, they usually are caused by errors or omissions either in the time study or in the payroll distribution, and they must not be permitted to remain in the record.

Any needed reconciliation of the time study field notes with the foreman's time card should be made at the end of each shift, or daily, in order that differences can be investigated and eliminated.

Where time studies are limited to include only a part of an operation, such as a study of form erection in a few blocks rather than total form erection for the period, arrangements should be made in advance to have payroll distribution and quantity estimates of the section under observation shown separately in order that the necessary check may be made.

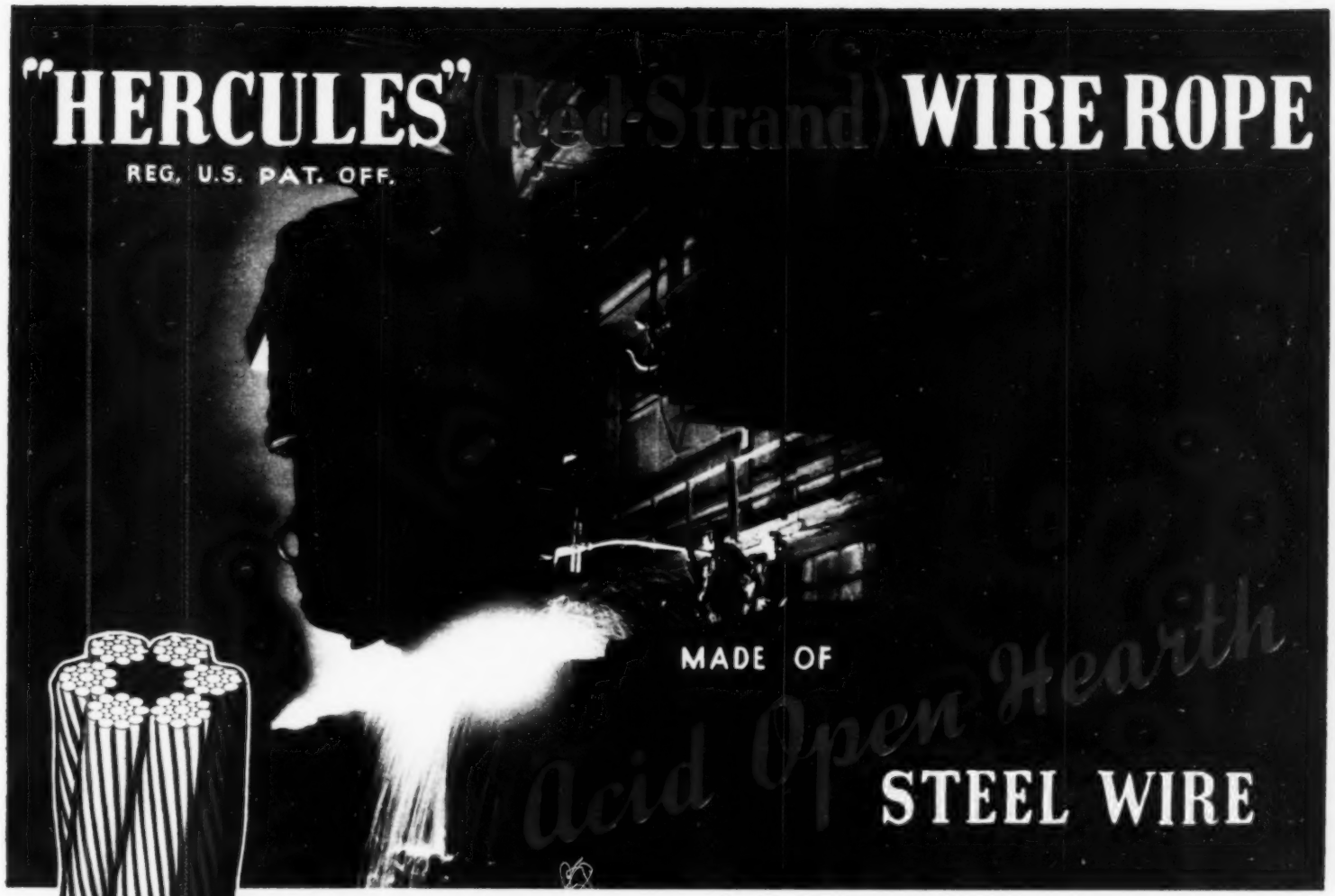
Foremen should be instructed to enter labor distribution on their cards in such a manner that the person making the time study can properly check his reported man-hours and costs with those shown on each foreman's card. Such a check should be made at the end of each shift and differences reconciled before they are forgotten. This procedure often will reveal considerable lost time not otherwise shown in the study. It is hardly necessary to point out that a time study should include all hours which the shift worked unless it is definitely known that some men were working on an item not included in the scope of the time study.

When the results of time studies are

(Continued on page 94)

"HERCULES" (Red-Strand) WIRE ROPE

REG. U.S. PAT. OFF.



All Leschen Steel Wire Ropes are made of acid open-hearth steel wire, because such wire has specific and decided advantages in producing wire rope that is more uniform . . . more dependable . . . longer lasting.

Acid open-hearth steel is more uniform in its chemical analysis, freer from slag and impurities, and has a higher elastic limit for the same carbon content than basic open-hearth steel. Most important to the wire rope user, however, is the fact that wire rope made from acid open-hearth steel wire has higher fatigue resisting qualities, which means longer life in actual service.

And our policy of leaving nothing to chance in the manufacture of "HERCULES" *(Red-Strand)* Wire Rope, not only makes it long lasting, but safe and economical as well.

For maximum efficiency in Preformed Wire Rope, use Preformed "HERCULES". It is available in both Round Strand and Flattened Strand constructions.

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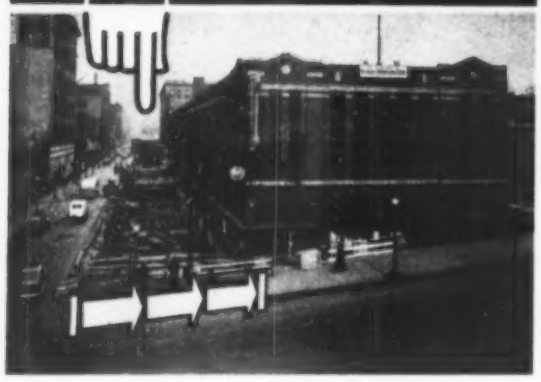
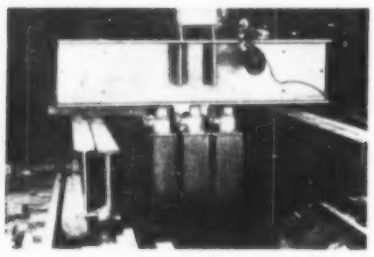
DUFF-NORTON JACKS move Block-long Building



ALMOST 100 Duff-Norton Jacks were used by Eichleay Engineering Corporation in raising and moving the 10,000 ton Central Square Garage of Youngstown, Ohio.

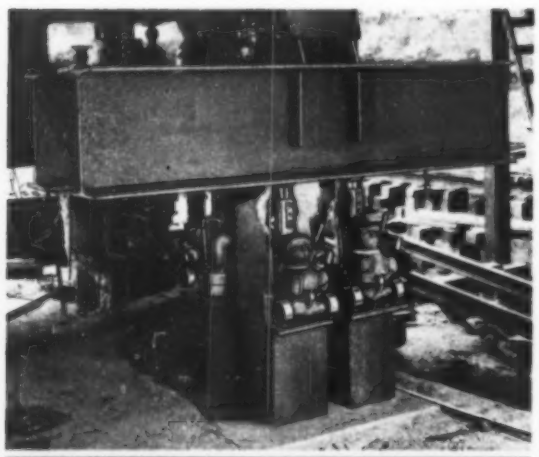


This modern 4-story steel frame building, the longest ever moved by this world-famous concern, was jacked up to clear old footings, moved back 27 feet from the old street line and lowered to the new footings.

In raising the building, jacks were placed under steel brackets welded to the 66 columns. As the Duff-Norton Jacks brought each row of columns to its full ½ inch raised position, rollers were wedged into place. This process was reversed in lowering the building onto its new footings.

The Eichleay Engineering Corporation is one of many progressive companies who rely on Duff-Norton Jacks because they have found them to be economical and dependable.

In order that you may be thoroughly familiar with the Duff-Norton line (which includes 300 standard types and sizes of jacks) we will gladly send you Catalog 113 which shows items used in construction work—Duff-Norton ratchet types, screw jacks, rotary air motor power jacks, bell bottom types, trench braces, push-and-pull jacks, etc.



The DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.
CANADIAN PLANT COATICOOK, QUEBEC
"The House that Jacks Built"

(Continued from page 92)

being discussed, this question usually presents itself: Did the efficiency of the foreman and workmen increase while under observation? It is important to be able to answer this question correctly. Much light will be thrown on the subject if proper planning, including the location of the survey and its extent, is made considerably in advance. Arrangements then can be made to have foremen who are working on items to be included in the survey report on their cards the time spent on the major items of work to be studied. This information then can be included in the labor distribution. When this method of reporting labor distribution is started two or three weeks in advance of the time studies and is continued after the studies have been completed, it serves as a guide as to what occurred during the survey.

Factors Affecting Time Studies

It is unnecessary to point out that, if time studies are to serve a useful purpose, they should be truly representative of job conditions. There are many factors which affect progress and unit costs, and consideration must be given to these items in interpreting results obtained. Among questions to be considered are the following:

(1) What are the weather conditions?
(2) Does the location under observation represent average conditions?
(3) Are the foremen and workmen under observation more or less efficient than the average?
(4) Does the fact that the labor forces are under observation have any effect on production?
(5) Are external job conditions normal, that is, are operations at a stage where construction is increasing, decreasing or at maximum efficiency? Are there any unusual delays, etc.?
(6) What delays or interruptions occur, and how can they be reduced?

These and many other factors affect production, and their effect on time study results should be carefully weighed and noted by some one whose experience and judgment are above question. The cooperation of the job superintendent is necessary.

Reports of Time Studies

Time studies involve the collection of a large amount of data too voluminous to be easily understood. Tabulation of these data must be made in a logical manner, and summaries prepared of these tabulations. Such summaries should contain the full results of the studies, arranged in logical sequence. Details supporting the summaries should be concise but complete.

Although the general form of the report is largely determined by the scope of the work, it should be kept constantly in mind that time studies made on any particular project are likely to be used as a basis of comparison on other projects. Clearness, completeness, conciseness and correctness are basic requirements of the report.

It is important that a complete report of the study be made as promptly as possible after its completion. If there is delay in the preparation of the report, many items bearing on the subject are likely to

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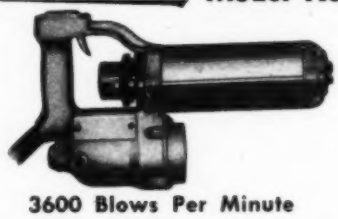

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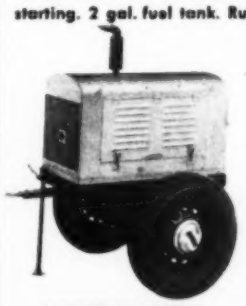

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be overlooked or forgotten. Even more important, any definite recommendations which can be offered toward cost reductions must be made promptly in order to realize the greatest possible savings.

If a survey extends over a period greater than two or three weeks, it is important that an interim report be prepared of results obtained in the partial survey. Such a report will usually suggest lines on which further studies are desirable. Assumptions made from data collected can be further checked later.

At the time when the interim report is prepared, items on which sufficient information has been obtained can be dropped, and more extended investigations can be made of those items that appear to demand further study. Preparation of interim reports greatly expedites the final report.

Time studies are statements of fact that should be considered as such. Certain assumptions and conclusions are possible from the facts presented, and the difference between facts and assumptions should be clearly shown.

Definite Recommendations in Order

Definite recommendations are always in order where time studies reveal opportunities for definite savings on future work by more efficient handling. It is as much the duty of those making the survey to report on the efficiency of methods and men as it is to report the hours consumed in doing the work. A false loyalty to the men in the field at the expense of the purpose of the survey has no place in a time study.

It usually happens that time studies reveal uneconomical operations, avoidable delays, and skilled labor doing the work of unskilled men. Definite suggestions for savings can be brought to the attention of the superintendent. Where such suggestions are accepted and placed in effect, it is interesting to make comparisons between these savings and the cost of the survey, provided the comparison can be made without starting a useless controversy.

It will be found desirable, at times, to repeat a time study of some particular operation for a brief period. When such brief restudies are made, interesting and useful information can be obtained as to what progress has been made in carrying out suggestions for more economical operation.

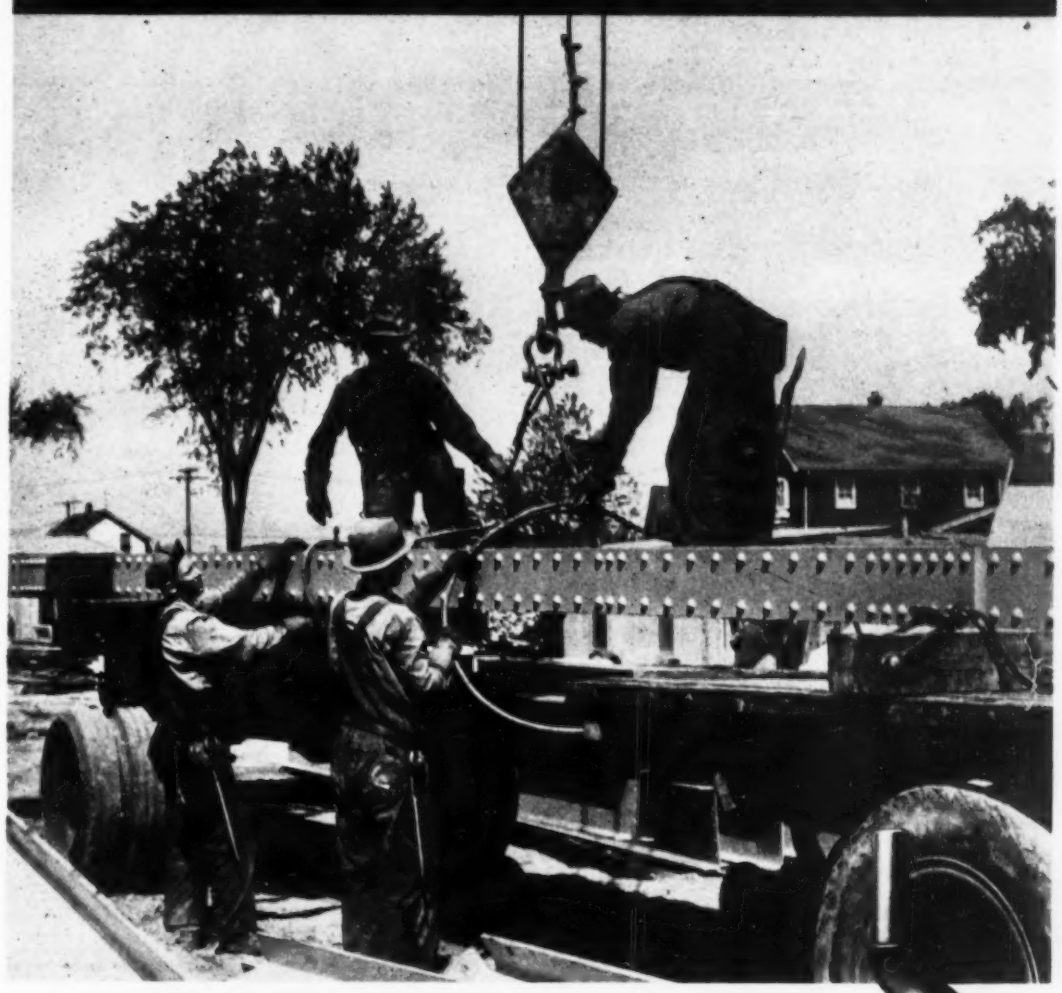
Use of curves and charts, for presenting in most concise form the information obtained by a survey should be given careful consideration. Information which might require several pages in a descriptive report often can be shown on a single chart requiring only a minute to read.

Distribution of Report

There is no more useless expenditure on a construction job than money spent in the preparation of reports never used, and nothing is more annoying to superintendents and foremen than to expend time and energy in assisting in the compilation of data that they never see. It is essential that all useful data have as wide distribu-

(Continued on page 96)

"VULCAN" HOIST HOOKS
are individually proof-tested



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Identify Williams' "Vulcan" Hoist Hooks by their orange tip.

Williams' trade mark, "VULCAN", on Hoist Hooks is the cheapest insurance you can buy against unnecessary hazards and hoisting accidents. Every "Vulcan" Hoist Hook is individually *proof-tested to 50% beyond* its rated "safe working" load. Each Hook, so tested, is stamped with the mark O, illustrated at right, and therefore can be readily identified as "proof-tested".

Williams' "Vulcan" Hoist Hooks are forged from selected steel, specially heat-treated to provide maximum strength and toughness and to reduce to an absolute minimum their liability of breakage. "Vulcans" are available in Shank and Eye patterns up to 25 tons capacity. Sold by industrial distributors everywhere — write for descriptive literature.

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RANSOME 34-E "Dual Drum" Paver. Special Pavers with extra long Inclined Booms or Towers available.

RANSOME 3½-S Runabout Mixer with Batch Hopper of low shoveling height, also furnished in 5-S size.

RANSOME Standard Building Mixers, 28-S, 56-S, 84-S, and 126-S — a complete line from 3½ cu. ft. to 5 cu. yds.

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RANSOME 3½-S Tilting type Runabout Mixers.

(Continued from page 95)

tion as is consistent with their proper use. If the studies are carefully planned and properly executed, they can frequently be used by the job superintendent to effect savings many times greater than the cost of the survey.

NEXT MONTH: **— The fifth and concluding article of the series on Wood Panel Forms will discuss methods of utilizing time-study and cost data for the benefit of the construction personnel.**

* * *

Early-Strength Cement AIDS HIGH SPEED CONSTRUCTION

(Continued from page 44)

1,000 lb. per square foot without settlement. As the basement floor was to be left unfinished, the forms for the first floor had to be shored off the cinder fill. Had ordinary strength concrete been used, the contractor's normal procedure would have required leaving 6x6-in. posts in place under the floor for 14 additional days after forms had been stripped at the end of 4 days. Under these circumstances, large timber mats would have been needed under the posts to spread the load on the fill.

By using Lehigh early-strength cement in the floor concrete, need for posts was eliminated, and the contractor was able to remove forms and shores as soon as the concrete developed 2,000-lb. required ultimate strength, ordinarily in 72 hr. The high-early-strength concrete thus released the forms and shores one day earlier for reuse, in addition to saving the cost involved in placing special mats and heavy posts and the further cost of reposting for 3 to 4 weeks.

Floor Design

With the exception of four transverse bays of beam-and-girder design, the entire floor is reinforced-concrete flat slab with drop panels over the column capitals. One of the beam-and-girder bays carries the floor across a small stream which intersects the structure. The other three bays of this design are made necessary by large openings in the floor. Reinforced flat slab was constructed in thicknesses of 10, 10½, 11½ and 14 in. to carry live loads of 400, 500 and 800 lb. per square foot.

At the stream crossing, a War Department requirement that 4-ft. clearance above high tide be maintained during construction posed a falsework problem. A

(Continued on page 98)

For Pennsylvania's Turnpike

TELSMITH EQUIPMENT

Served in These Twelve Commercial Quarry Plants

Contractors' Service Corp.
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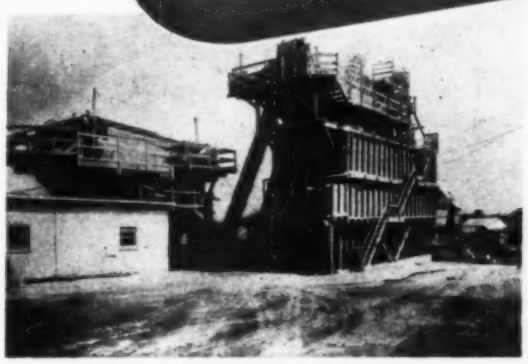
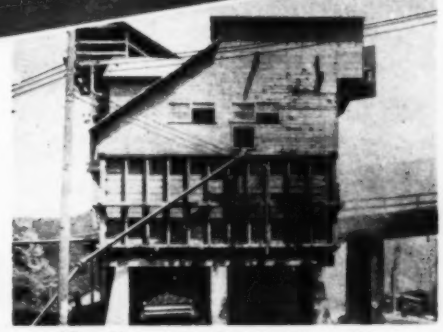


Shippensburg Stone Co.
Shippensburg, Pa.



New Enterprise Stone & Lime Co.
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OTHER PLANTS (not shown) USING TELSMITH EQUIPMENT: Hunkin-Conkey Construction Co., Somerset, Pa.; J. F. Sours, Carlisle, Pa.; Vang Crushed Stone Co., Connellsville, Pa.; Pennsylvania Supply Co., Harrisburg, Pa.; Lycoming Silica Sand Co., Montoursville, Pa.; New Enterprise Stone & Lime Co., Roaring Springs, Pa.

TP-1

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7/29/40

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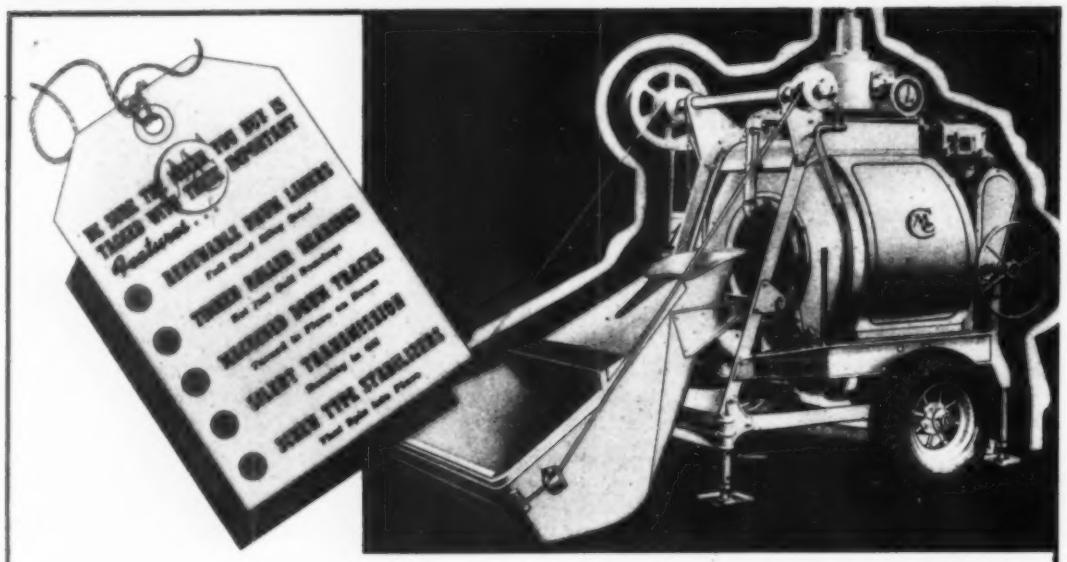
PLANT: ROCKAWAY, NEW JERSEY WAREHOUSES: JOLIET, ILL. — NEW ORLEANS, LA.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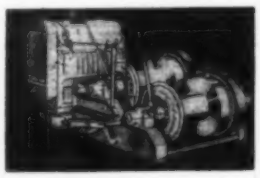


Write TODAY for latest CMC catalog showing newest in Concrete, Plaster, Mortar and Bituminous Mixers, Pumps, Power Saws, Hoisting and Placing Equipment, Carts and Barrows.

CONSTRUCTION MACHINERY CO., Waterloo, Iowa

(Continued from page 96)

beam-and-girder bay of 32-ft. 8-in. span, c. to c. of concrete piers, bridges the stream. Some overtime work beyond the limits of a normal 8-hr. day was required to complete the pier footings between 4-ft. tides which surged up the creek twice every 24 hr.

To shore the entire bay, 32 ft. 8 in. long by 94 ft. wide, the contractor rented twelve I-beams (up to 27-in. 144-lb. section) and cribbed them up from the pier footings. Second-hand 12x12-in. timbers were laid across the tops of the beams to support shores under the forms.

Floor Schedule

A typical day's concreting on the floor completed two bays, about 200 cu.yd., in 5 hr. During the period of continuous floor construction, the schedule called for concreting on alternate days, with form stripping on every other day and with form erection on every day but one in each 5-day week.

Floor construction started at the north end, connecting with the existing building. Four flat slab bays lie between this building and the stream crossing, with two additional beam-and-girder bays following immediately south of the creek. To permit uninterrupted construction and wheeling of concrete over completed floor from the north end to the first bays south of the creek, the contractor built five bays of flat slab forms and three bays of beam-and-girder forms.

Concrete Forms

Because of the large area of floor forms required to speed this phase of the construction process, the amount of form lumber used was large. In all, the forms and shores required 125,000 b.-ft. including 3,200 sq.ft. of ⅝-in. concrete-form-grade plywood for exposed surfaces of exterior columns, spandrel beams and basement curtain wall.

Flat slab bays ranged in area from about 15x20 to 22x20 ft. Each bay was formed with five panels which were moved ahead for successive reuses in the same aisle. Carpenters on the job made up the panels of 1x6-in. t. & g. flooring. When erected, the panels rested on 4x6-in. stringers supported by 4x4-in. shores set at about 3x4-ft. centers on 3x12-in. plank sills.

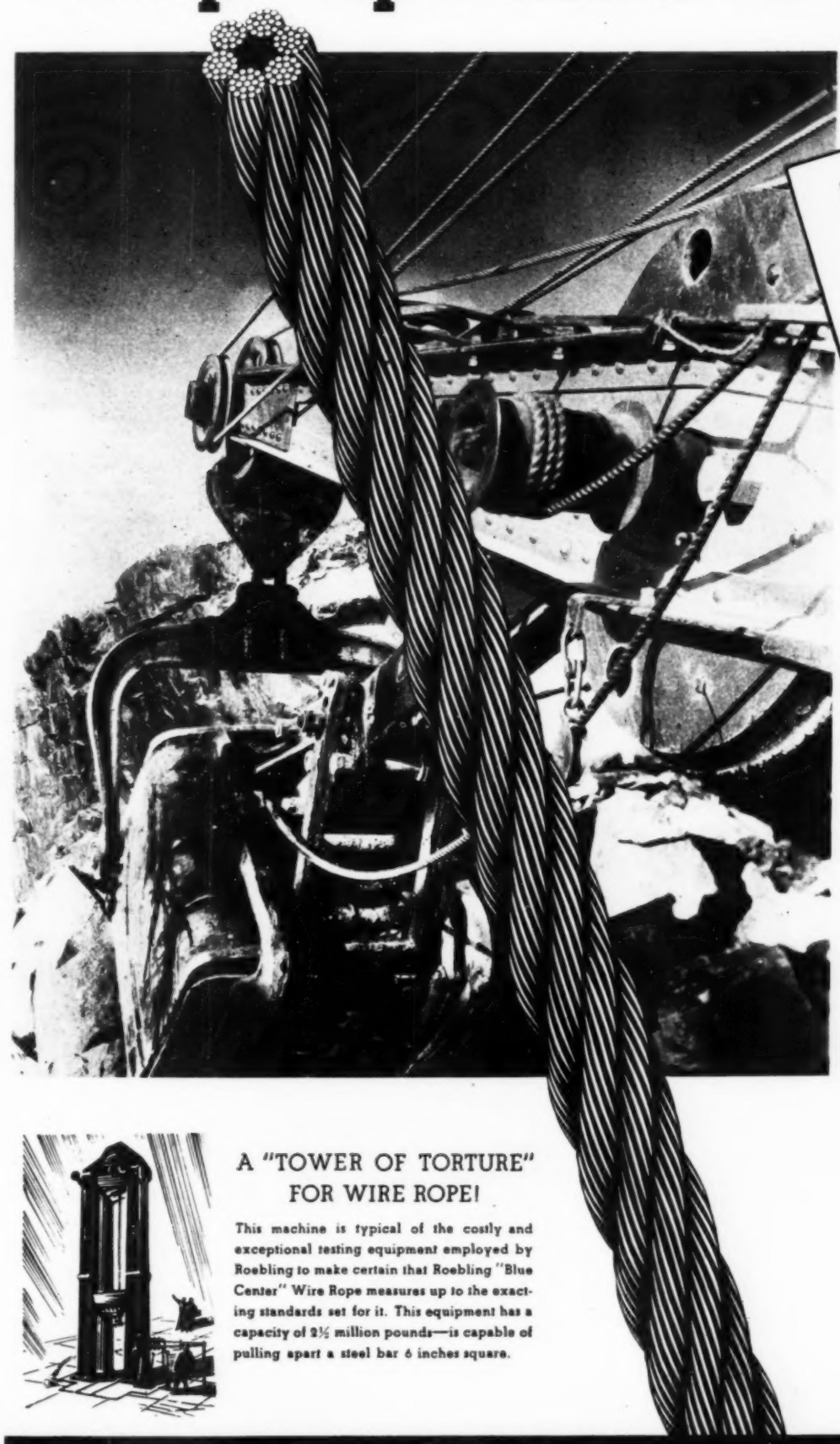
Concrete Requirements

Total volume of concrete for the foundry extension amounted to about 3,200 cu.yd., reinforced with 120 tons of steel bars. Footing concrete designed for 2,000-lb. compressive strength at 28 days and column mixes designed for 2,000- and 2,500-lb. strengths were made with ordinary portland cement. Column concrete ordinarily was placed on the day preceding floor concreting.

For the 2,000-lb. concrete in the floor, the mix per cubic yard contained five sacks of high-early-strength cement, 1,350 lb. of sand and 1,915 lb. of gravel up to 1-in. maximum size. Weather permitting, mixing water was held to 7.2 gal. per sack, including moisture in the aggregate. On

(Continued on page 100)

Strip Rope Costs to the Bone...



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WIRE ROPE

STANDARD OR PREFORMED

Every dollar saved counts on most earth moving and construction jobs. That is why an ever-increasing number of contractors are taking advantage of the cost-cutting ability of Roebling "Blue Center" Wire Rope.

First of all, "Blue Center" is the finest of all Roebling Wire Ropes. It represents the highest achievement of all Roebling's research and manufacturing efforts. It has been developed with the one idea of producing a super-quality rope—one which will assure the maximum of durability, safety and economy in rope service. Made of famous Roebling acid open-hearth steel—it provides the highest degree of resistance against abrasion, fatigue and sudden shocks.

You can easily prove the cost-cutting and safety advantages of Roebling "Blue Center" Wire Rope. Install "Blue Center" when you re-rope your equipment. Keep accurate service records. Compare. Then, you be the judge.

A "TOWER OF TORTURE" FOR WIRE ROPE!

This machine is typical of the costly and exceptional testing equipment employed by Roebling to make certain that Roebling "Blue Center" Wire Rope measures up to the exacting standards set for it. This equipment has a capacity of 2½ million pounds—is capable of pulling apart a steel bar 6 inches square.

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No other saw can give you the power and cutting performance of a Modern SKILSAW because no other saw has the background of 20 years of constant improvement that has made the FIRST electric handsaw THE BEST on the market today! SKILSAW out-performs all others on any kind of sawing job — it saws faster and deeper . . . it saves time and labor costs on every cut you make! Modern SKILSAW is *more for your money* and it *will make more money for you* — on all your jobs for years to come! 9 powerful models for wood, metal, stone and composition.

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CHICAGO

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SAWS · BELT SANDERS · GRINDERS · BUFFERS
DRILLS · DISC SANDERS · FLOOR SANDERS
PORTABLE ELECTRIC TOOLS
SEE YOUR DISTRIBUTOR . . . he will gladly demonstrate how SKILSAW TOOLS will save you money

(Continued from page 98)

hot days, additional water was necessary to assure sufficient moisture in the concrete by the time it was deposited in the forms.

Mixing and Placing

Concrete was supplied in Rex 4-yd. truck mixers by the Silliman & Godfrey Co., Bridgeport. A Turner inspector checked batch weights at the charging plant, and mixing water was not admitted to the drums until the trucks had arrived at the job. Each 4-yd. batch was mixed 8 to 10 min. after water had been added.

A Lorain truck crane with a 30-ft. boom was leased by the day as required to handle concrete in 1-yd. Blaw-Knox roller-gate buckets from the truck mixers to a 4-yd. floor hopper which was never filled to more than three-quarters capacity. From the hopper, which discharged through two manually controlled gates, concrete was wheeled over wooden runways in 4-cu.ft. pneumatic-tired concrete carts. Nine carts were available on the job, but six were sufficient in all cases to handle distribution from the hopper.

Concrete was vibrated internally with Jackson high-frequency hydraulic vibrators driven through hose connections from portable gasoline-powered pumps. The contractor used two of these vibrators.

Floor Topping

A ¾-in. topping of 1:1¼:1¾ mix, consisting of standard cement, sand and pea gravel, was spread on the green structural concrete and hard-troweled to a smooth finish. As soon as the floor topping had taken its initial set, the concrete was covered with moist sand which was kept wet for 7 days. Exterior faces of the spandrel beams were protected during the same period with wet burlap.

Concrete Cylinders

To test the strength of floor concrete for form stripping, the contractor made up test cylinders of the mixture in its wet-test condition, as discharged from the truck mixers. At the time these notes were written, records available for cylinder tests of the first eight and one-half bays concreted gave compressive strengths at 3 days ranging from 1,717 to 3,072 lb. per square inch, averaging about 2,500 lb.

Structural Steel

Roger Sherman, Hartford, erected 300 tons of steel for the Lehigh Structural Steel Co. with a Lima 50-ton crawler crane carrying a 100-ft. boom and 25-ft. jib which gave it a reach sufficient to set steel from one side clear across the width of the building. Telephone and power lines erected on poles outside the property fence on the opposite side of the building made it practically necessary to handle all steel from the inner side. Lifts were light, the maximum erection load being 3 tons and the heaviest pick-up in unloading trucks 7 tons.

Welded fabrication simplified design of the connections, as indicated by an accompanying sketch showing the streamlining of main craneway rail brackets and offset monitor columns resulting from

SAFETY — THE KEYNOTE OF THE PENNSYLVANIA TURNPIKE — IS ASSURED

HERE COMMERCIAL TUNNEL SUPPORTS
MAINTAIN THE ALL-IMPORTANT SAFETY FACTOR!

● Safety . . . the outstanding characteristic of the Pennsylvania Turnpike's operation as well as its construction . . . is assured in its tunnels, for in all of them COMMERCIAL Tunnel Supports carry the load.

Economically speaking, COMMERCIAL was a sound choice, for these superior tunnel supports save both time and materials cost, and decrease actual tunneling time — an important item where penalty clauses are in force. And as for safety, COMMERCIAL Supports are tangible security, both during construction and in later operation. These many COMMERCIAL benefits cannot be observed as you travel at high speed through the tunnels on the Pennsylvania Turnpike . . . but they are factors whose value can be seen on the engineers' and contractors' tunneling project balance sheets. Let COMMERCIAL'S Engineers work with you on your next job . . . COMMERCIAL Supports and Liner Plates are adaptable to any size tunnel, in all types of ground.

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THE OTHER PUMPS QUIT

Results mean more than words. Talk is cheap and anyone can make a lot of unproved claims. But on the job a pump must do its own talking. Try out a G & R pump and then you be the judge.

GORMAN & RUPP PUMPS

AGAIN THE CONTRACTORS BOUGHT GORMAN-RUPP

On the new Shore Parkway project at Brooklyn two centrifugal pumps one an 8-inch and the other a 4-inch, clogged and quit. Two "Can't Clog" G & R 6-inch pumps replaced the quitters and for weeks pumped 24 hours per day.

Gorman-Rupp Pumps Can't Clog. They are not quitters. That's why MORE CONTRACTORS ARE STANDARDIZING ON GORMAN-RUPP PUMPS THAN ANY OTHER MAKE. They will pump MORE WATER and pump MORE HOURS at LESS COST.

Let a Gorman-Rupp Pump prove these statements. Phone our nearest distributor for a trial pump.

PROMPT DELIVERY . . . from Stock in 100 Principal Cities . . .

THE GORMAN-RUPP CO., Mansfield, Ohio

(Continued from page 100)

adoption of the welded design. Well-organized welding shop facilities of the steel fabricator completed all framing units in ample time for delivery and erection on the job.

Labor Force

At the peak of its operations, the Turner Construction Co. employed on the job two carpenter foremen and 44 carpenters, one general labor foreman and 50 laborers, one concrete foreman, one cement mason foreman and six cement masons, and one ironworker foreman and six ironworkers.

Administration

Plans for the foundry extension of the Bullard Co., Bridgeport, Conn., were prepared by Alexander D. Crosett, engineer, New York, in consultation with the owner and with the Turner Construction Co., contractor. For the contractor, E. A. Courter, superintendent, was in charge of all job operations, including construction, inspection and delivery of materials. To save time in the job office, steel deliveries were expedited by the contractor's main New York office.

* * *

Speedy Tunneling ON CARLTON DRAINAGE BORE

(Continued from page 67)

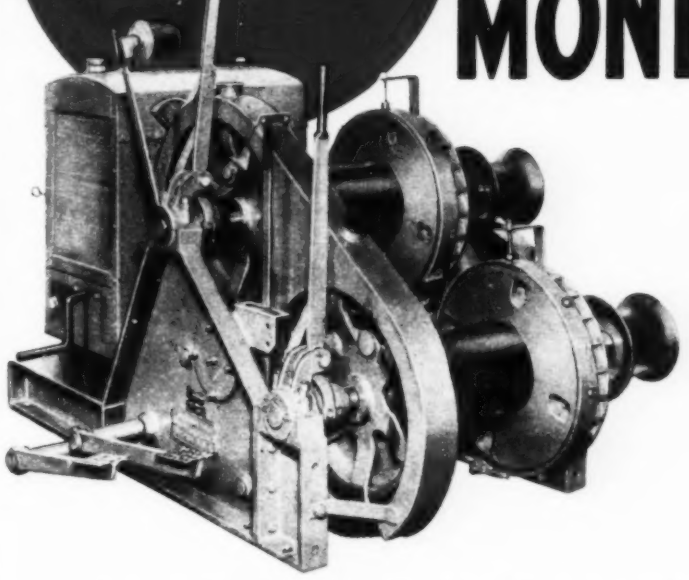
rate of 5,000 cubic feet per minute.

Blasted rock from the heading is loaded into Granby steel cars of 87-cu.ft. capacity by an Eimco-Finlay loader, operated by compressed-air motors. The time for mucking an 8-ft. round with this machine is from 50 to 60 min. Car service to the loader is maintained by 8-ton General Electric 56-cell storage battery locomotives, operating on 2-ft. gage track of 45-lb. steel rails. Empty cars are switched from the rear to the front of the train by a "cherry-picker" in the form of a movable steel frame equipped with an air hoist which raises an empty car vertically to provide clearance for a loaded car beneath it. Headroom for the operation of this device is provided every 100 to 200 ft. in the tunnel by blasting about 2 ft. of rock from a portion of the roof. This improved "cherry-picker" supersedes the one originally used, which required the setting of horizontal I-beams at intervals between the tunnel walls to carry a hoist for shifting the mine cars. The present car-shifting frame is designed to afford clearance for the movement of muck trains, drill jumbo and loader.

As representative of the progress being made in the Carlton tunnel the following

(Continued on page 102)

MORE HOIST FOR LESS MONEY



THE NEW MODEL 20

AMERICAN GENERAL PURPOSE HOIST

has many features found in no other hoist in its price class — Stand-out superiorities which lift it high above all competitive hoists of corresponding capacity:

For instance:

1. Frictions and brakes are at opposite ends of the drum for cool running.
2. Shrouded ratchet ring with chisel type dog.
3. Drive shaft turns in anti-friction bearings and is placed between the drums — both drums revolve in the same direction.
4. Improved band type frictions: easy to engage: economical.

In a word — MORE HOIST for LESS MONEY.
Write for Bulletin No. 100-H-0.

AMERICAN HOIST & DERRICK CO.
NEW YORK SAINT PAUL, MINNESOTA CHICAGO

AMERICAN TERRY DERRICK CO.
SOUTH KEARNY, N. J.

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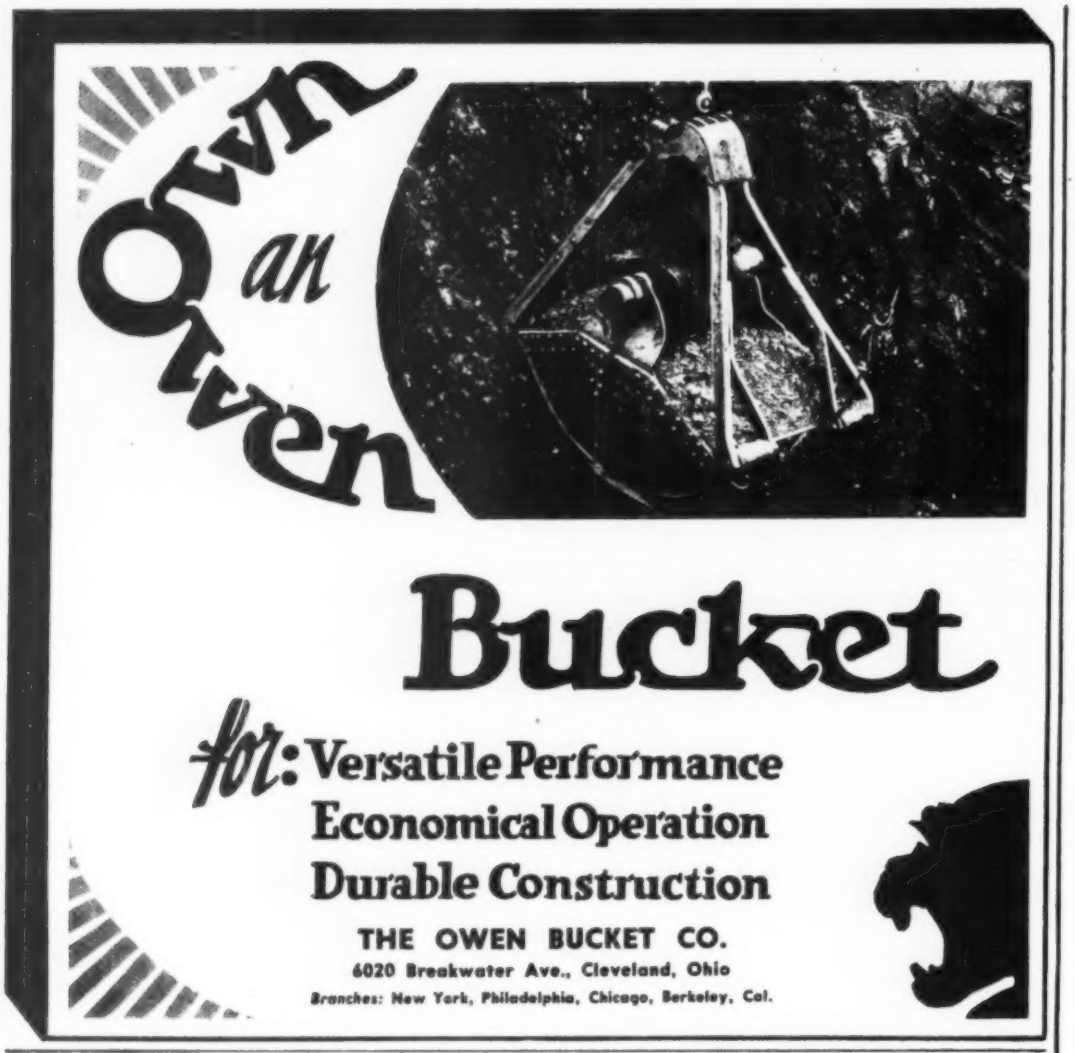
STANDARDIZE *on the Genuine* CROSBY CLIP

PERFECT GRIP • DROP FORGED STEEL • HOT DIP GALVANIZED *safe since 1883*

DEALERS WITH STOCK IN ALL PRINCIPAL CITIES



BALANCED
Equipped with Solid Rubber or Pneumatic Tire Wheels
Features:
HARD MAPLE HANDLES
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WELDED TRAYS — NO RIVETS
LARGER TRAY ROD — BUTT WELDED
V-FRONT BRACES — CROSS SUPPORT
CHANNEL STEEL LEGS WITH SHOES
Where tray sheets lap, both sheets are folded around the butt-welded rod in top edge, forming double reinforcements, as shown by the cross-section at the left. This is an extra Sterling value.
STERLING WHEELBARROW CO. MILWAUKEE, WIS.

(Continued from page 101)

figures for the month of April, when the heading was advanced 1,696 ft., are reported: Rounds drilled and blasted, 214; average advance per round, 7.95 ft.; average number of rounds per day, 7.13; average drilling time per foot of advance, 13½ min.; average mucking time per foot of advance, 12 min.; total explosives used, 57,250 lb.; pounds of explosive per foot of advance, 33.8.

Contributing to the high tunneling speed that is being maintained month after month is a bonus system under which extra compensation at the rate of $4 for each foot of progress in excess of 300 ft. per month is distributed among the workers, the amount for each man being prorated according to his wages.

Personnel—For the Golden Cycle Corp., which is driving the 32,000 ft. long Carlton tunnel Merrill E. Shoup is president and Alfred H. Beebe, vice-president and general manager of mining operations. In immediate charge of tunneling operations is John R. Austin, superintendent; shift bosses are L. A. Stiles, A. E. Stiles and E. Gardner. Bob Welch is master mechanic and J. G. Farmer is engineer.

* * *

CANADA BUILDS 91-MILE Express Highway

(Continued from page 49)

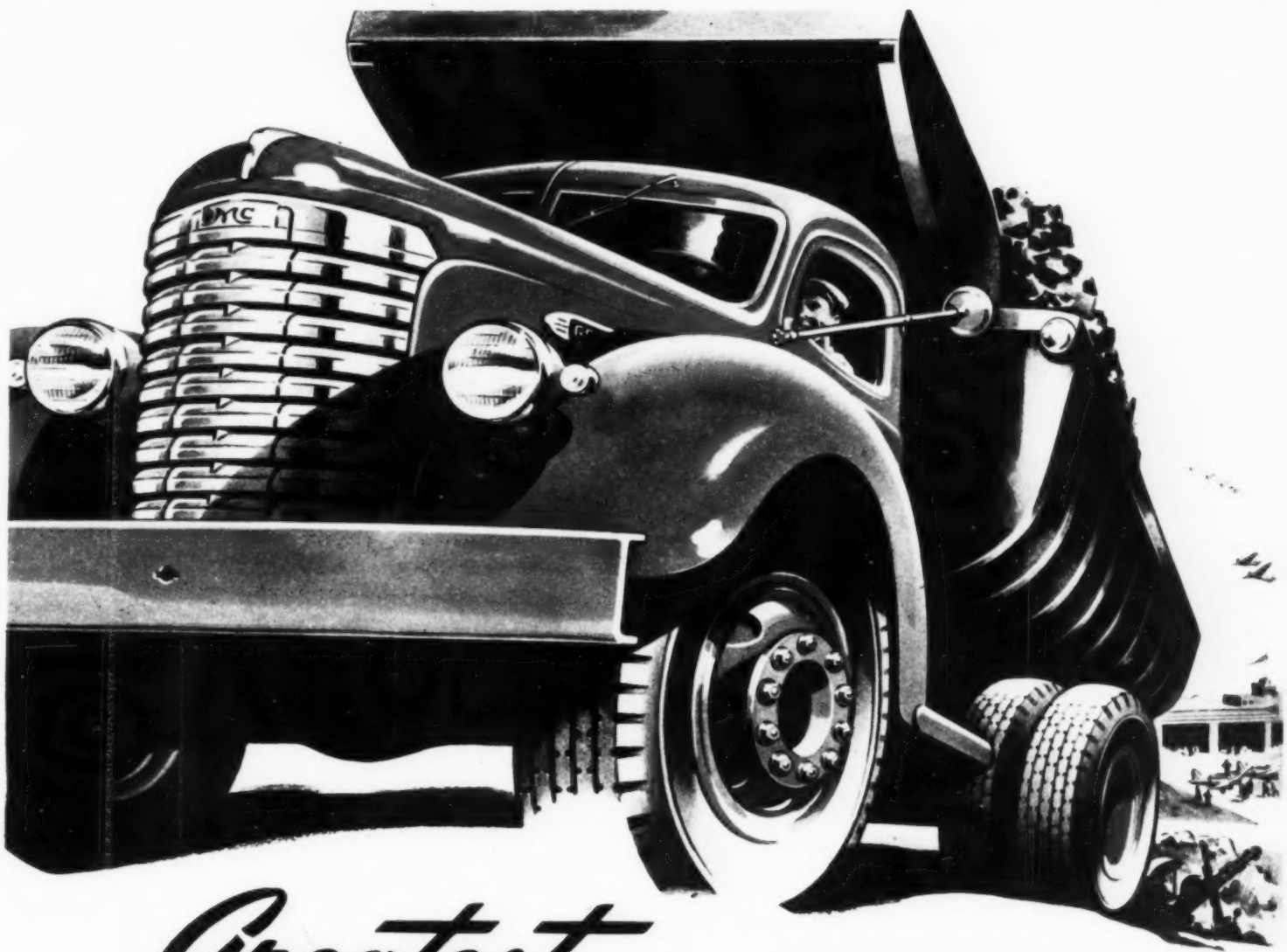
tions, all the major exits and entrances consist of full or semi-cloverleaves. Approaches are designed to avoid congestion. For example, the spur connecting the highway with the new Rainbow Bridge at Niagara Falls will utilize a sunken roadway, or subway, over which the north-and-south travel on the Niagara Peninsula will pass without interruption. All congested centers — St. Catherines, Hamilton and others — have been by-passed. The highway has been bridged over, or carried under, all heavily-traveled intersecting roads.

Altogether, there are 50 bridges over streams, canals, and railroads. There are 23 grade-separations, including full and semi-cloverleaves. Most of the bridges are floodlighted at night and many of them are double structures. One of these is the ornate Henley Bridge, over the Henley Regatta Course near the location of the first canal between Lake Erie and Lake Ontario.

Highway Begun In 1931

The construction of the highway began in 1931 with the acquisition of the right-of-way and the building of traffic structures. Most of the bridges and cloverleaves were in place before grading operations

(Continued on page 104)



Greatest DRIVING POWER of ALL TRUCKS

Truck buyers today are finding a big difference in the way some trucks perform! Engine displacement is no longer a true index to driving power. GMCs are outpulling other trucks with engines "rated" as much as 15% larger. It's a matter of open record that GMC SUPER-DUTY Engines deliver *highest torque* in every size from 228 to 451 cu. ins. That means quicker acceleration, faster hill climbing, longer gas mileage! In many other ways, too, GMC owners "get the breaks." GMC FRICTION-FREE Steering reduces steering effort as much as 57%. GMC SYNCRO-MESH Transmissions (in heavy duty models) make gear-shifting as quick and easy as in your car.

Our own YMAC Time Payment Plan assures you of lowest available rates

New

6-CYLINDER MODEL ROUNDS OUT GMC DIESEL LINE

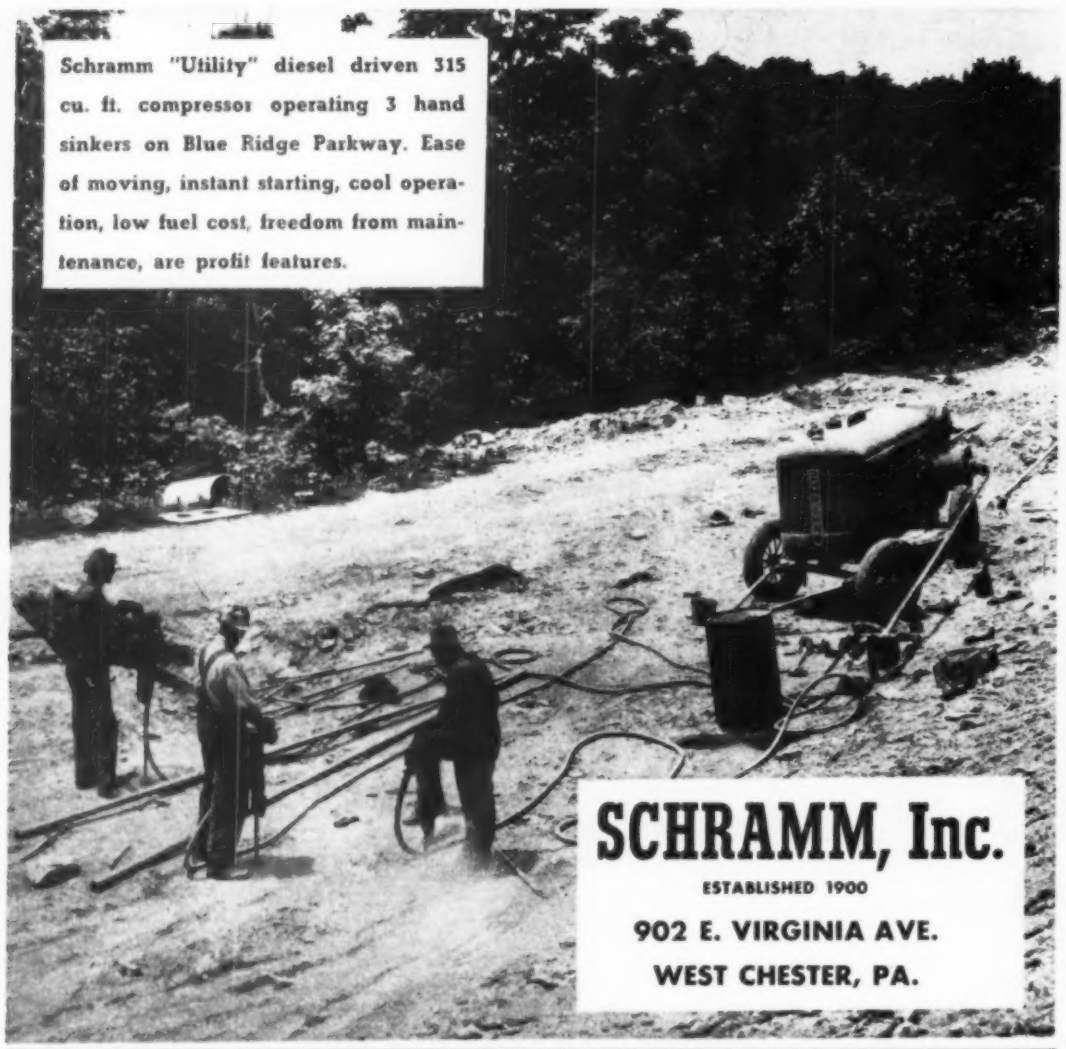
The new 6-cylinder 165-h.p. GMC Diesel meets heaviest hauling needs where utmost power is demanded.

ONLY GMC OFFERS ALL THIS EXTRA VALUE
SUPER-DUTY Engines with TURBO-TOP Pistons • FRICTION-FREE Steering • RIDER-EASE Cabs

THE TRUCK OF VALUE

GMC TRUCKS

GASOLINE ★ ★ DIESEL


Schramm "Utility" diesel driven 315 cu. ft. compressor operating 3 hand sinkers on Blue Ridge Parkway. Ease of moving, instant starting, cool operation, low fuel cost, freedom from maintenance, are profit features.
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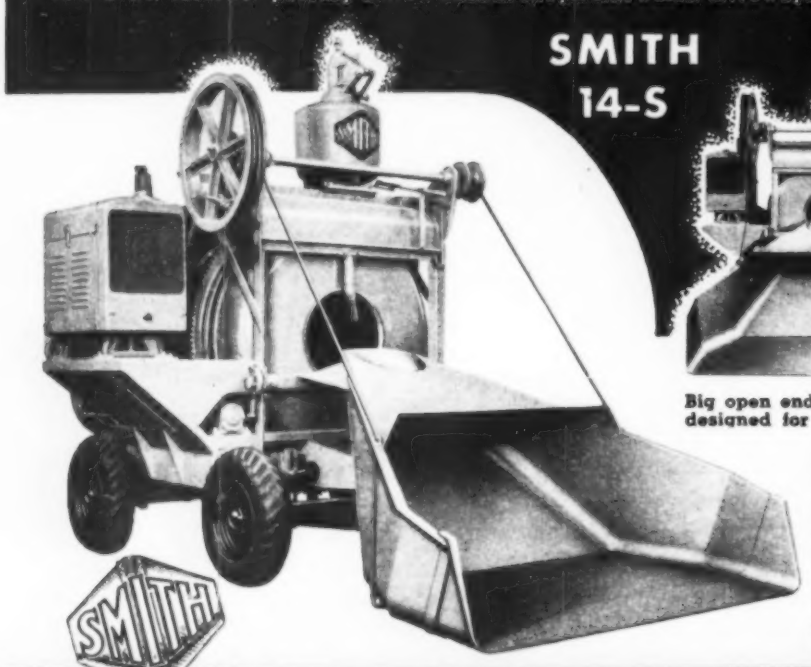
BIG PROFITS *from* SMALL PAVING JOBS!

Why use a large costly 27-E Paver on small paving jobs when this modern, ½ yard mixer will do the work just as well and more economically. Equipped with extra wide open end "paver" skip for speedy truck charging. Famous Smith "End-to-Center" mixing action. Fast end discharge. Puts paving on a really profitable basis. Ideal for pouring narrow streets, alleys, sidewalks, driveways, etc.



Big open end skip, 90" wide, designed for truck charging.

Features include: Auto-type steering; spring-mounted axles; enclosed gear reduction; vertical syphon-type water tank.

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SMITH MIXERS
USED ON THE WORLD'S GREATEST CONCRETE PROJECTS

(Continued from page 102)

started. The grading, now entirely complete, was done by the Carter Hall Construction Co., of Toronto. Eight paving contractors who speeded the completion of the Niagara Falls-Toronto stretch were assigned sections 5 or 6 mi. long. A healthy competition resulted and in one instance a contractor laid as much as 20,000 ft. of single-lane roadway a day between Niagara Falls and Burlington. The construction schedule on another section called for the completion of 175 mi. of single-land roadway in eight weeks. The contractors for paving the Queen Elizabeth Way included: Scott Jackson Construction Co., Leaside, Ontario; Brennan Paving Co., Hamilton; A. Jupp Construction Co., Toronto; George Raynor Construction Co., Leaside; Domestic Construction, Toronto and Montreal; Warren Bituminous Co., Toronto; A. Cope & Sons, Hamilton; and Dufferin Paving Co., Toronto.

The project is under the direction of the Hon. T. B. McQuesten, K.C., minister of highways for Ontario and chairman of the Niagara Parks Commission. R. M. Smith is deputy minister of highways for Ontario. A. A. Smith is chief engineer for the province.

* * *

150-Ft. Steel Towers FOR NIGHT BASEBALL FLOODLIGHTING

(Continued from page 47)

Field, Pittsburgh, home of the Pirates.

It would be wise, perhaps, in order better to understand some of the problems facing the mechanical designer, to summarize the lighting design. Unlike other sports fields, the illumination over the baseball park is not uniform; it is brighter in the infield than in the outfield; it is brighter still along the alley between pitcher and catcher. In order that the players can follow high fly balls, the upper air of the park must be illuminated. The playing field must be clear of all obstructions and any lights must be located high enough so that glare is kept out of the players' eyes. Illumination intensity is necessarily high, on the order of 125 to 225 foot-candles. These lighting requirements, to be fulfilled, mean that:

(1) Large numbers of lighting units must be used — 864 were employed at Forbes Field.
(2) Units must be mounted on towers located around the field; 8 towers were used here.
(3) The number of units on each tower varies, depending on the intensity desired and the area to be illuminated. Towers are of uniform design with

(Continued on page 106)

What's behind this straight-out "O.K." of RPM DELO lubrication? Months of bulldozing, dirt moving, logging, farming, by powerful Allis-Chalmers Diesel tractors working "with their sleeves rolled up!"

Allis-Chalmers adds its field experience to the many millions of hours of outstandingly successful RPM DELO lubrication in all types of Diesel engine operation throughout the world—and every hour of this tremendous total proves again—

That RPM DELO *stops ring sticking* in any Diesel in the hottest, hardest operation. That RPM DELO *ends* sludge trouble—that it cuts engine wear to an *all-time low*—that it assures *super-smooth* engine break-ins.

Some oils do some of these things—some do others. *But RPM DELO is one lubricating oil that does ALL of them for ALL Diesels—yours included.*

It's made to make your engines run better—last longer—need fewer overhauls. Let your Diesel equipment show you that it *does!*

UNEQUALED FOR EVERY DIESEL

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The California Company (Montana only)
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Dial RPM DELO:
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Colonial Beacon Oil Company
Standard Oil Company of Louisiana
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Whiteman "Precision" Cement Floor Finisher comes equipped with gasoline or electric drive, complete operating control with finger snap switch, V-Belt drive, and adjustable rotating trowels.

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Faster . . .

Your cement finishers can cover twice the area with the "Precision" Cement Floor Finisher — which will travel over 1,000 sq. ft. in as little as 15 minutes. The rotating, adjustable pitch trowels glide over the surface under absolute control of the operator — produce flatter, smoother floors in half the time. "Precision" is the *only* machine that completely FLOATS and STEEL TROWELS a cement floor.

More Perfect Floors . . .

You will get a far denser, more wear-resistant floor without laitance or voids caused by water or air particles. You can use a low water ratio, for the weight of the machine will compact your aggregate, bringing what little water you have to the surface. The coarse aggregate will be uniformly distributed throughout the entire finish and right up to the wearing surface. You get an absolutely level floor without high or low spots or riffles, due to the action of the rotating steel trowels.

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You finish cement with "Precision" at substantially reduced cost, for this machine finisher eliminates unnecessary costly overtime. It is real insurance against your floor "getting away from you" when extra finishers are not available.

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The "Precision" Cement Floor Finisher has given successful performance everywhere, being used on work for the Pacific Telephone & Telegraph Bldg., Los Angeles; Lockheed Aircraft Corporation, Burbank; Alameda Naval Base, Alameda, Cal.; and many other jobs.

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UNEQUALLED FOR COLOR WORK

Color is pressed in evenly, leaving no light or shaded spots to show up after the floor has set.

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MAHON — a name identified with many outstanding accomplishments in modern bridge building.

VAN HAAREN — Bay City moving and erecting engineers whose knowledge and skill is widely known throughout eastern Michigan.

ROGERS — the trailers used by the Van Haarens in their heavy and unusual moving operations.

KNOWLEDGE possessed by the Van Haarens and facilities afforded by their Rogers Trailers permit the Mahon organization to fabricate large girders at their local plant and haul them to points distant from Detroit.

A majority of the better movers throughout the country and in several foreign lands depend upon Rogers Trailers for their heavy and unusual operations. You, too, will find in them a combination of the practical features that assure profitable operation.

ROGERS BROS. CORPORATION

220 Orchard St. Albion, Penna.

EXPERIENCE *built it* PERFORMANCE *sold it*

(Continued from page 104)

two exceptions: the number of cross-arms and the type of base, whether free standing or roof-mounted. Each of the eight towers has a height of 150 ft. above the playing field. They are mounted some distance back of the playing field to insure sufficient illumination for play on foul hits. The grandstand surrounds about 75 per cent of the field which necessitated mounting five of the eight towers on the grandstand roof.

The American Bridge Co., which designed and erected these towers, decided upon bolted-angle construction. The bolted construction simplified field erection, eliminating the equipment which would have been needed for riveting or other types of fabrication. Most important, the bolted design made possible a completely hot-dipped galvanized tower, eliminating the need of painting and future paint maintenance. Four 6x6x⅝-in. angles form the main uprights, these being braced laterally by smaller angles. The VHR-18 floodlight employs cast-iron cross-arm mounting brackets. Cast-iron, in addition to its ability to withstand severe weather conditions, provides greater supporting strength for the floodlight than other cast metals.

Construction Sequence

Construction began April 1, 1940, when work was started on the 15-ft.-deep reinforced concrete foundations for the three free-standing towers. Anchor bolts, embedded in the concrete foundation, hold down the towers. The upright steel sections, each section being 25 ft. high, were then erected. The first section was lifted into place by hand. As a means of lifting the succeeding 25-ft. sections into position, a 4-in. floating pipe pole was fastened inside the top portion of the erected first section. This pole was tractor-operated.

Two uprights, to which the lateral angle bracing had been loosely bolted while still on the ground, then were hoisted into place and secured. The remaining two uprights, with their lateral angles also loosely bolted on, were hoisted into place. The lateral bracing between the two half sections then was quickly bolted into final position by workmen on the tower. The section was plumbed for vertical straightness, after which all the bolts were tightened up and the second tower section completed.

This same procedure was carried through for the remaining four 25-ft. sections, the floating pole being moved up as each section was completed. The cross-arm structure, also of angle construction, was loosely assembled on the ground. Its bracing angles were bolted on and the ends to be attached to the tower were left dangling free. This semi-assembled unit was hoisted to the top of the tower where workmen rapidly made it fast.

Roof Towers

The five roof towers were built up in the same manner, excepting, of course, that the number of sections per tower was less than for the free-standing towers.

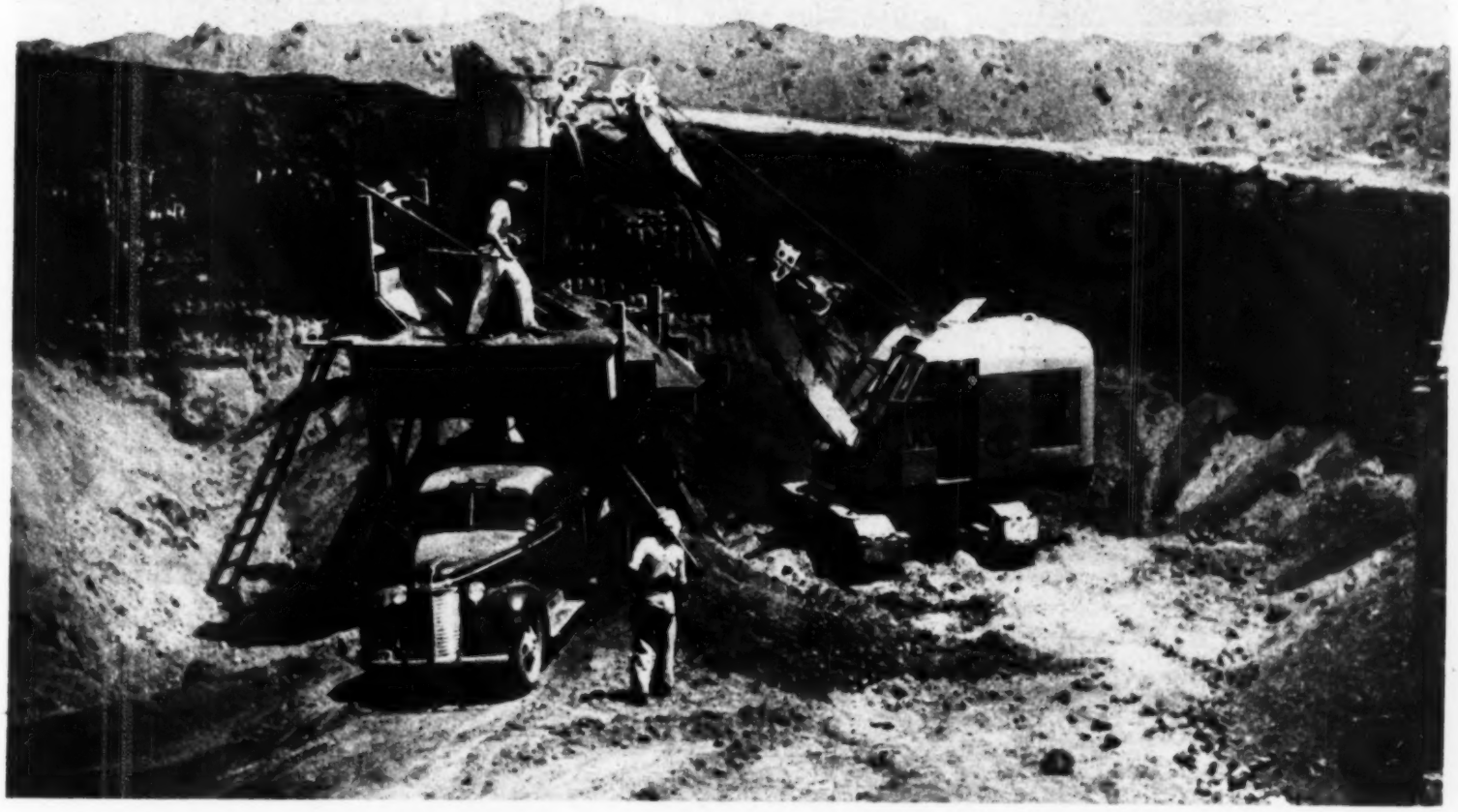
(Continued on page 108)

POWER ..*to tip on its toes*

SPEED ..*to keep truckers humping*

STRENGTH ..*to finish whatever it starts*

FLEXIBILITY ..*to apply itself on your work*



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DETROIT, MICHIGAN

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11125 E. 8 Mile Blvd., Detroit
Send free leaflet on Carboloy Masonry Drill-Points, for drilling concrete 75% faster.

Name_____

Company_____

Street_____

City_____ State_____

CARBOLOY
MASONRY DRILL-POINTS

(Continued from page 106)

However, the roof towers had to be supported by the grandstand superstructure. This itself rested upon a steel truss framework which, in turn, was held up by the grandstand columns. To provide a base for the towers, an assembly resembling a bridge was fabricated in the American Bridge Co. shops. It consisted of two CB sections (similar to I-beams but having wider flanges) separated by two smaller sections at right angles to the first two. This assembly was riveted in the shops, transported to Forbes Field, where it was lifted and bolted into place under the grandstand roof. It straddled two of the existing roof trusses, forming a "bridge base" for the tower to be built up from. The base was designed to give the necessary added support and still match the existing steel work installed 30 years ago.

Wiring Procedure

Upon completion of the tower erection, the next step was wiring. All wire used was weather-proof type and was carried over the stands and under the ground in metal conduit or fibre duct. The towers were completely wired before the floodlighting reflectors were mounted. This was possible because the floodlights used had a bayonet heel construction which fitted into a similar device on their mounting brackets. Hence the mounting bracket was bolted into place, on the cross-arms, and the wires were connected at the fuse panels before the reflector was installed. This feature greatly aided the men mounting and wiring the floodlights, as it permitted a far greater working space than would have been possible if the complete floodlights had had to be handled. Further, it is far simpler to handle a small, lightweight mounting bracket than a complete floodlighting unit weighing 21 lb., when bolting it to the cross-arm and working at great heights.

Special Engineering Required

Power is brought to Forbes Field at 22,000 v. Three 500-kva. transformers in a fireproof vault reduce this high voltage and distribute it in two separate circuits of a three-phase four-wire grounded neutral system to transformers mounted in the towers. The tower transformers further reduce the voltage from 2,300 to 120 v. The lamps are rated at 110 v. but are run at 10 per cent over-voltage, which increases the lumen output by 35 per cent with only a 16 per cent increase in power input. Fireproof inerteen-filled transformers are used in the roof tower to insure added protection to the ballpark patrons.

Construction jobs such as this each require their own special engineering. No standard towers, no standard erection scheme or construction method can be made to cover all. Every baseball park is different, not only in size, but in arrangement. Lighting requirements are somewhat similar for all, yet each requires its own peculiar locations, intensities and wiring arrangements. It is because of these things that baseball lighting in the major leagues represents one of the most highly specialized, yet widely diversified, fields of modern construction.

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Youngstown Airport Runways SURFACED WITH SLAG-ASPHALT

(Continued from page 52)

plan shows a typical layout of drainage grid.

Runways 150 ft. in width are sloped on a flat grade (varying from 0.43 to 1.4 per cent) from the upper to the lower edge. Along each edge of the runway is a porous drainage trench 3½ ft. wide at the top and 3½ ft. deep, backfilled with ¾- to 4-in. slag on top of 8-in. pipe laid with open joints in the bottom of the trench. The slag fill is topped with 2 in. of porous premixed asphaltic concrete; this trench paving really increases the useful runway width to a total of 158 ft.

Shallow, grassed drainage ditches 6 in. deep are located 20 ft. from each edge of the runway, with catch basins averaging 6 ft. deep spaced at intervals of 300 ft. along the ditches. Under the drainage ditch at the lower edge of the runway is placed the intercepting main which collects and carries away the drainage delivered to the catch basins of the interceptor system by 10-in. transverse drains which connect with the drop inlets on the upper side of the runway and, by means of cross-connections, with the intermediate transverse subgrade drains. An accompanying typical runway section shows this drainage arrangement.

Transverse subgrade drains, consisting of 6-in. pipe laid with open joints 3½ ft. below pavement grade in trenches backfilled with ¾- to 4-in. slag, are spaced on 60-ft. centers throughout the length of the runways, with the exception that a 10-in. transverse collecting drain, already described, laid at 16-in. greater depth, is substituted for every fifth pipe. Transverse 6-in. drains are connected at both ends to the edge drains. Pipe in the interceptor increases in size to a maximum of 20 in., as required to carry collected drainage. Both concrete and vitrified clay pipe are being installed at the airport; a small percentage of the transverse drains are constructed of flat-top vitrified pipe.

Runway Pavement

Construction of four 150-ft. runways, three of them 3,600 ft. long and the fourth 3,850 ft. long, calls for laying 253,000 sq. yd. of cold-mixed, cold-laid asphaltic concrete 2 in. thick on 8-in. compacted slag base and for placing 20,000 sq.yd. of concrete in seven turnarounds. Runway pavement is built up in a series of operations between concrete header curbs 18-in. deep, spaced 150 ft. apart, outside to outside. The operations consist of: (1) spreading and tamping a 1½-in. insulation course of slag fines under ¾-in. size; (2) placing

(Continued on page 110)

When you want water moved, you want it moved cheaply. Trick names and gadgets for pumps don't move water. It's the job performance that tells the story you want to know.

Here's the performance record of those Novo Self-priming Centrifugal Pumps — 8-months operation without a complaint or pump failure in the field. Millions of gallons of water without a forced shutdown. That's the way to get water moved cheaply.

The whole story is told in the complete simplicity of these Novo Pumps. There's no air seal on the impeller shaft; it's not needed for the impeller is always submerged. They are self-sealed. The packing that keeps the water in is the greaseless type and requires no attention.

Novos are the only self-primers with adjustable wear-plates on both sides of the impeller. That's the reason for the sustained large volume and the fast priming even after months of service. Another reason why you get cheap water moving.

There are ten sizes from the 1½", 3,000 GPH, to the giant capacity 8" pump that handles 125,000 GPH. Mountings are available for any purpose — from skids to a high-speed, automotive-type trailer that can be trailed at any speed safe for the towing truck or car.

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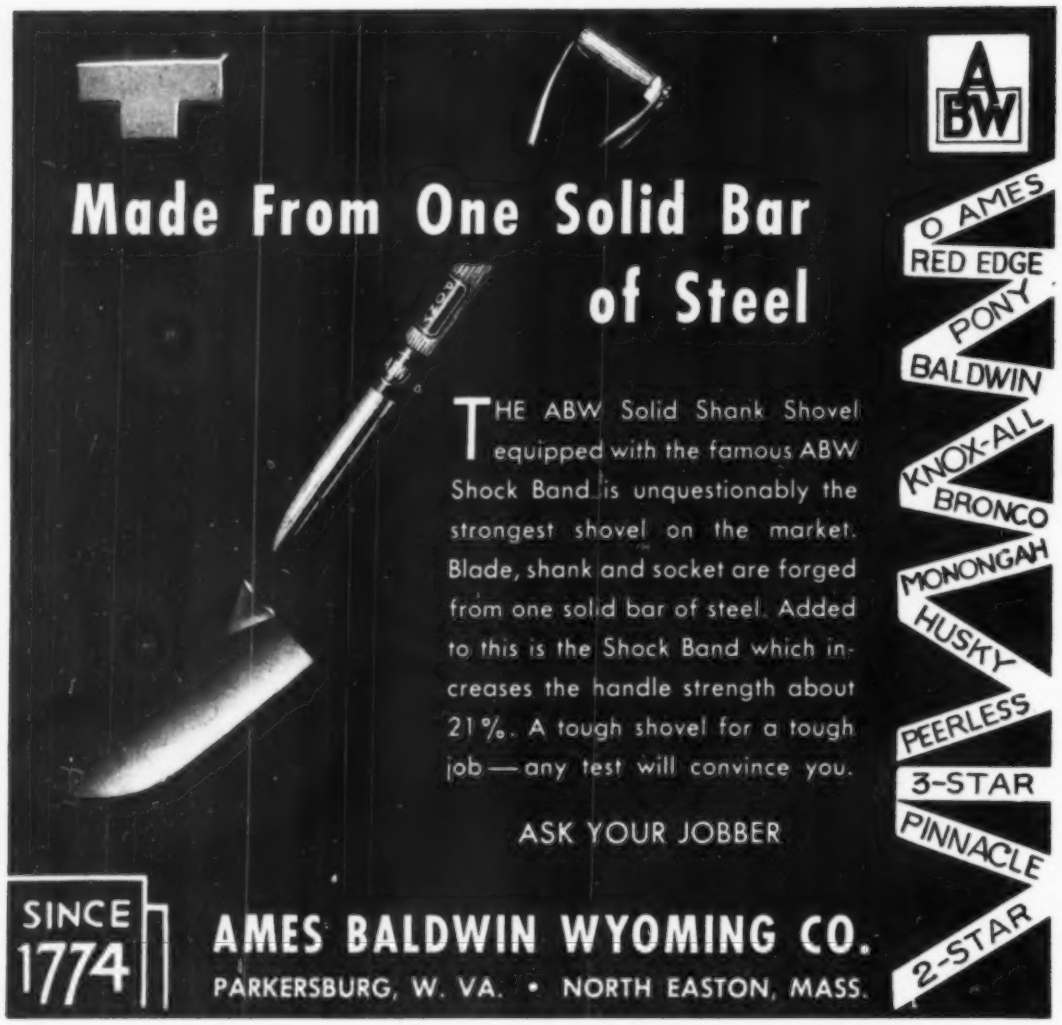
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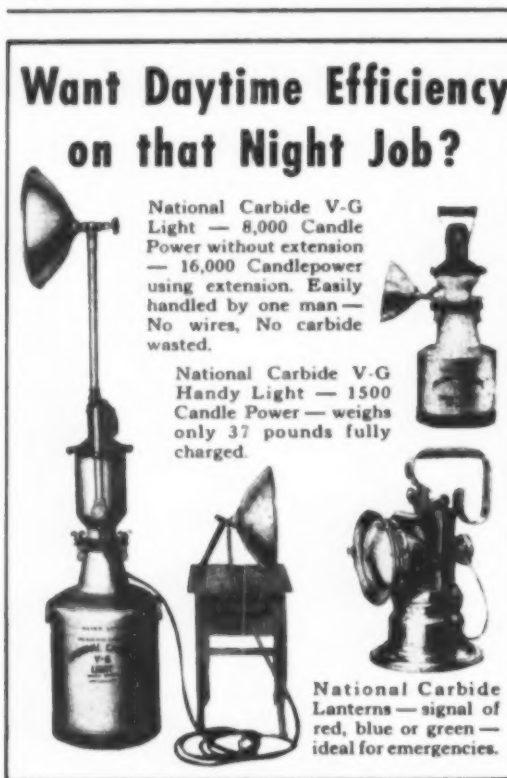
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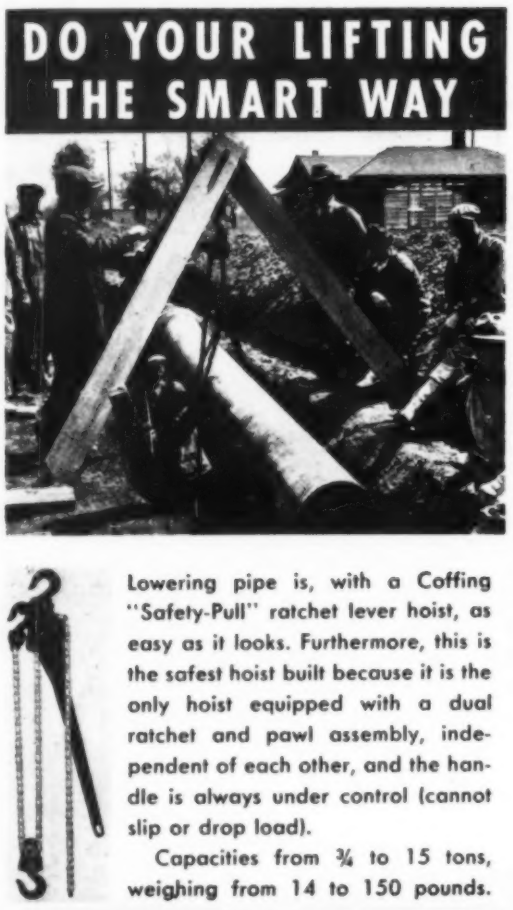
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(Continued from page 109)

two courses of slag ¾- to 4-in. size, each course compacted to 4-in. depth and completely filled with slag screenings, making 8 in. in all for these two courses and a total depth of 9 in. or more for the slag base; (3) laying a 2-in. top of premixed asphaltic concrete in two courses of 1 in. each. This pavement is constructed at a cost of about $1.80 per square yard.

Slag Base

As the first step in base construction, ungraded slag is dumped by truck on the subgrade and is separated into larger and smaller sizes by hand with slag forks having tines spaced ¾ in. apart. For inverted choke construction, to keep the clayey subgrade from working up into the larger slag when the rollers start compaction, smaller separated slag less than ¾ in. in size is spread on the subgrade in a 1½-in. layer, hand-tamped to form a tight insulation mat. Over this insulation course, workmen spread the larger slag to a depth which will give a 4-in. compacted thickness after rolling. Oversize slag fragments are napped to 4-in. maximum dimension. Three-wheel 10-ton rollers compact the slag course and work into the keyed material as great a quantity of slag screenings (Ohio No. 7 specification, ⅜-in. to dust) as the larger slag will take. Additional slag screenings are added on the surface as the choke material works down into the voids.

Similar methods are employed in constructing a second slag course of equal 4-in. depth, completing the 9-in. slag base. For rolling the two courses the airport construction force operates three city-owned 10-ton three-wheel rollers, supplemented by four additional rollers of the same type and weight.

Slag is water-bound only to the limited extent possible with the meager sprinkling equipment available. The bulk of the slag has been placed without any water except that dropped by rains, which were frequent during the spring and early summer.

Compacted base, including filler, takes 95 lb. of slag per inch of thickness per square yard. For 9-in. base the total quantity of material required amounts to about 860 lb. per square yard. Excess fines left over after hand separation of the ungraded slag are used for access roads or are stored for later placement on parking areas.

Asphaltic Concrete Surface

Composition of the 1-in. binder course and 1-in. wearing course laid on top of the slag base corresponds in general to the T-60 specification for cold-mixed, cold-laid asphaltic concrete surface course of the Ohio State Department of Highways, with the exceptions that ¾-in. slag is the maximum size in the binder mixture and that the asphalt cement requirement of the highway specification is increased by 1 per cent both in binder course and in wearing course to compensate for the porosity of the aggregate and to produce a richer, more ductile mixture capable of resisting surface cracking of runway pavement, which has to get along without the healing, kneading effect of repeated traffic

(Continued on page 112)

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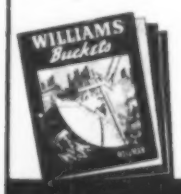

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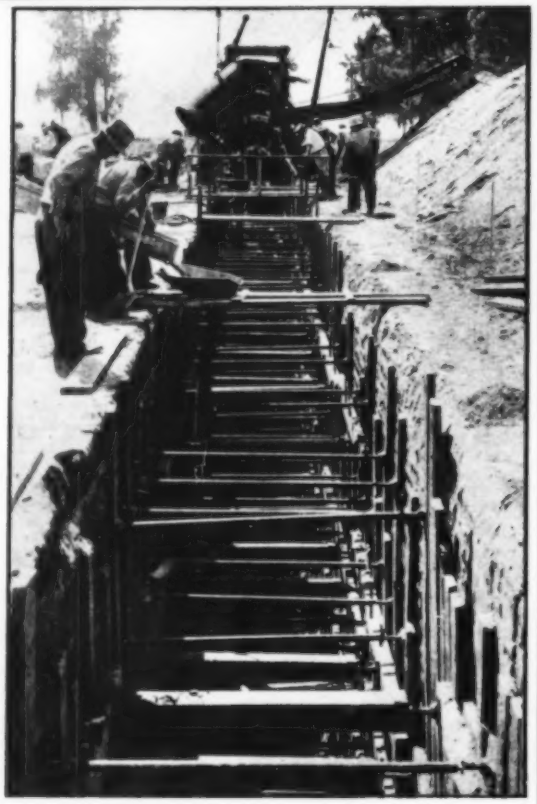

SIMPLEX Jacks
Awarded the Gold Medal for Safety

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(Continued from page 110)

usage such as is found on highways. Accompanying tables give the proportions by weight of Ohio T-60 binder course and wearing course mixtures used for surfacing the airport runways.

Slag for the base and premixed asphaltic concrete for the pavement are supplied by the Carnegie-Illinois Steel Corp. and the Standard Slag Co., Youngstown. From the latter company the city rents an Adnun

YOUNGSTOWN, OHIO, MUNICIPAL AIRPORT COLD-MIXED COLD-LAID ASPHALTIC CONCRETE SURFACE T-60 SPECIFICATION, OHIO DEPARTMENT OF HIGHWAYS

COMPOSITION BY WEIGHT

T-60 BINDER COURSE NO. 4

Sieve sizes		Per cent	
Passing	Retained on	Minimum	Maximum
1-in.	¾-in.	5	20
¾-in.	½-in.	20	50
½-in.	⅜-in.	15	40
⅜-in.	No. 6	15	40
No. 6		0	5
Hydrated lime		0.5	1.0
Liquefier		0.2	1.0
Bitumen		5.0	7.0

T-60 Type "B" WEARING COURSE

Sieve sizes		Per cent	
Passing	Retained on	Minimum	Maximum
½-in.	⅜-in.	0	10
⅜-in.	No. 4	35	65
No. 4	No. 6	5	25
No. 6		10	30
Hydrated lime		0.5	1.0
Liquefier		0.2	1.5
Bitumen		6.0	8.5

AGGREGATE GRADATION

Square openings	Total per cent passing	
	Binder course	Wearing course
1-in.	100	
¾-in.	80-95	
½-in.	40-65	100
⅜-in.	20-45	90-100
No. 4	0-5	10-35
No. 8		0-5

black-top paver which spreads and strikes off the two asphaltic concrete courses. Slag base is finish-rolled to allowable tolerances of ½ in. in 10 ft. and ½ in. from theoretical grade. Maximum surface variations permitted in binder course and wearing course are ⅛ in. in 10 ft. and ¼ in. from established grade. Two city-owned Galion rollers with hollow front and rear roller cylinders, which are filled with water to increase the weight per machine to 10 tons, compact and iron the binder course and top course.

Concrete Pavement

Turnarounds highly visible from the air are paved with 7-in. concrete which is reinforced with Truscon wire mesh weighing 81 lb. per 100 sq.ft. Using slag aggregate, a city-owned rebuilt 27E paver mixes concrete and places it on the subgrade inside Heltzel steel forms. Each of the first three completed turnarounds required 743 cu.yd. of concrete. In addition to the 20,000 sq.yd. of concrete pave-

(Continued on page 114)

Spreading Rock?

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For Concrete Paving— The 1940 MultiFoote 27-E better than ever— write for your copy of the new catalog

NOT since the first Adnun Paver revolutionized Black Top Paving has any road machine received the acclaim Adnuns are getting for their ability to put down rock. Owners are averaging 125 tons per hour output and one contractor reports 190 tons per hour when material delivery is fast enough! And that's laying it right to specifications--no voids or irregularities—you save raking and hand labor—cut costs—meet specifications—avoid time penalties.

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—the chapter of advanced information on concrete materials and the manufacture, treatment and properties of concrete

—the data on practical construction from experience on actual outstanding steel and reinforced concrete structures

—the practical combination of principles and data common to both water supply and sewerage problems

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(Continued from page 112)

ment in the turnarounds, another 15,000 sq.yd. will be placed in an apron in front of the hangar.

Progress

During May the project worked one 8-hr. shift six days a week and employed 1,140 WPA workmen on a typical day. The supervisors planned to put on a second shift as soon as the shovels got far enough ahead with the grading.

Final approval for construction of the airport was given on May 29, 1939, and operations at the site started a little more than five weeks later, on July 5. By the

FLAT-TOP vitrified drain pipe of 6-in. size is used in some transverse runway drains.

end of May, 1940, excavation totaling 1,000,000 cu.yd. was 40 per cent complete, paving of the 253,000 sq. yd. of runways and 20,000 sq.yd. of turnarounds was 25 per cent complete, and the drainage system was 65 per cent complete, with all trunk mains and 35 per cent of the runway drainage installed. Runways, administration building and hangar will be completed this fall. Pennsylvania Central, TWA and United Airlines have signed contracts to use the airport.

On base construction, laborers are distributed in crews totaling 70 to 80 men, divided into individual ten-men gangs with two men forking, two loading wheelbarrows, two wheeling, two napping, one leveling with a slag hook and one tamping fine material which is spread by forkers

(Continued on page 116)

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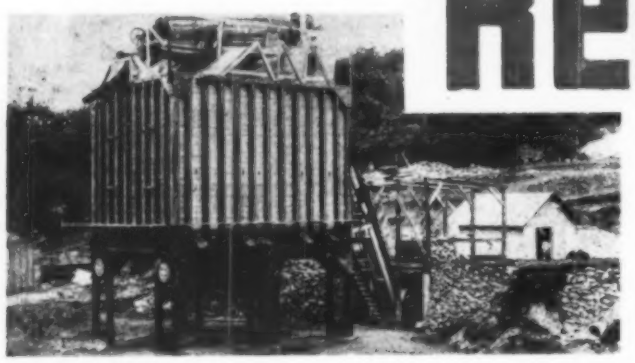

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Reliance offers a complete line of Rock Crushers; Bucket Elevators; Revolving Screens; Storage Bins; Pulverizers; Chip Spreaders; Heating Kettles; Bin Gates; Feeders; Belt Conveyors; Grizzlies; Air Separators; Sand and Gravel Spreaders; Wash Boxes.

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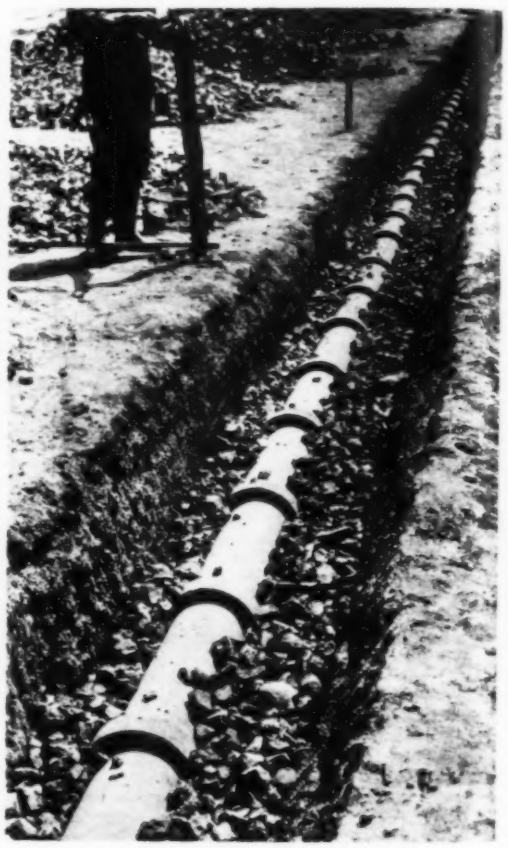
(Continued from page 114)

when not otherwise engaged. A 70-80-man crew averages 15 lin.ft. per hour of single-course slag construction, including insulation course, on 150-ft. runway, equal to 250 sq.yd. per hour.

Intermittent machine operations on binder course and top course are sufficient to keep the asphaltic concrete surface up with the progress of base construction. The



EDGE DRAIN at upper side of runway consists of 8-in. concrete pipe laid with open joints in trench backfilled with coarse slag.

Adnun black-top paver and a Barber-Greene spreading and finishing machine last fall put down 783 tons in one day, the Adnun working 8 hr. and the Barber-Greene part of the day. The asphaltic concrete covers about 11 sq.yd. of 2-in. thickness per ton of material.

Administration

For the City of Youngstown, Ohio, the airport was designed and is being built under the general direction of R. W. O'Neill, commissioner of engineering, with J. J. Smith, construction engineer, immediately responsible for execution of the plans and for operations at the site. The interests of the Work Projects Administration are represented by G. J. Kane, director of operations in the Akron district, and by E. S. Turner, project supervisor, who is immediately in charge of the large force of workmen engaged at the site.

It is worthy of note that the airport project really got its start under the direction of Edward H. Turner, father of the WPA project supervisor and former construction engineer for the City of Youngstown until his death early this year.

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The Results of Actual Field Tests Show

● 63% GREATER 3-DAY STRENGTH

Follow the arrow No. 1; note that concrete with calcium chloride had 675 lbs. transverse strength at 3 days (well above usual state requirements for pavement opening) as against 415 lbs. for plain concrete, a gain of 63% by use of calcium chloride.

● 4-HOUR REDUCTION IN FINISHING TIME

The reduction in time to reach minimum stiffening for effective final finishing shown at the point of arrow No. 2 — X to Y — approximately four hours — permits, as in this case, a saving in finishing costs sufficient to pay for the calcium chloride.

● MAKES UP 24° TEMPERATURE DIFFERENCE TO GIVE IDEAL CONDITIONS

Follow arrow No. 3; note that calcium chloride treated concrete placed at air temperature of 44-48° acquired necessary stiffness for finishing in almost exactly the same time as plain concrete placed at air temperature 70°. Calcium chloride thus practically offsets the usual considerable strength losses in concrete poured at from 60 down to 40 degrees.

To attain these beneficial results is both economical and simple. Two pounds of calcium chloride (costing 2 to 3 cents) per bag of cement should be added to the concrete mix, and can be introduced, in flake form, directly into the skip. Innumerable field tests have shown that the addition of calcium chloride will produce normal summer reaction in cold weather concrete, with correspondingly high early strength, thus permitting earlier finishing and quicker removal of forms. It will also improve density and water resistance, make concrete flow and fill forms better and produce the high early strength so important in cool to freezing temperature ranges. A detailed description of the penetration apparatus and procedure used in these tests, and literature on the use of calcium chloride in concreting are available on request.

CALCIUM CHLORIDE ASSOCIATION
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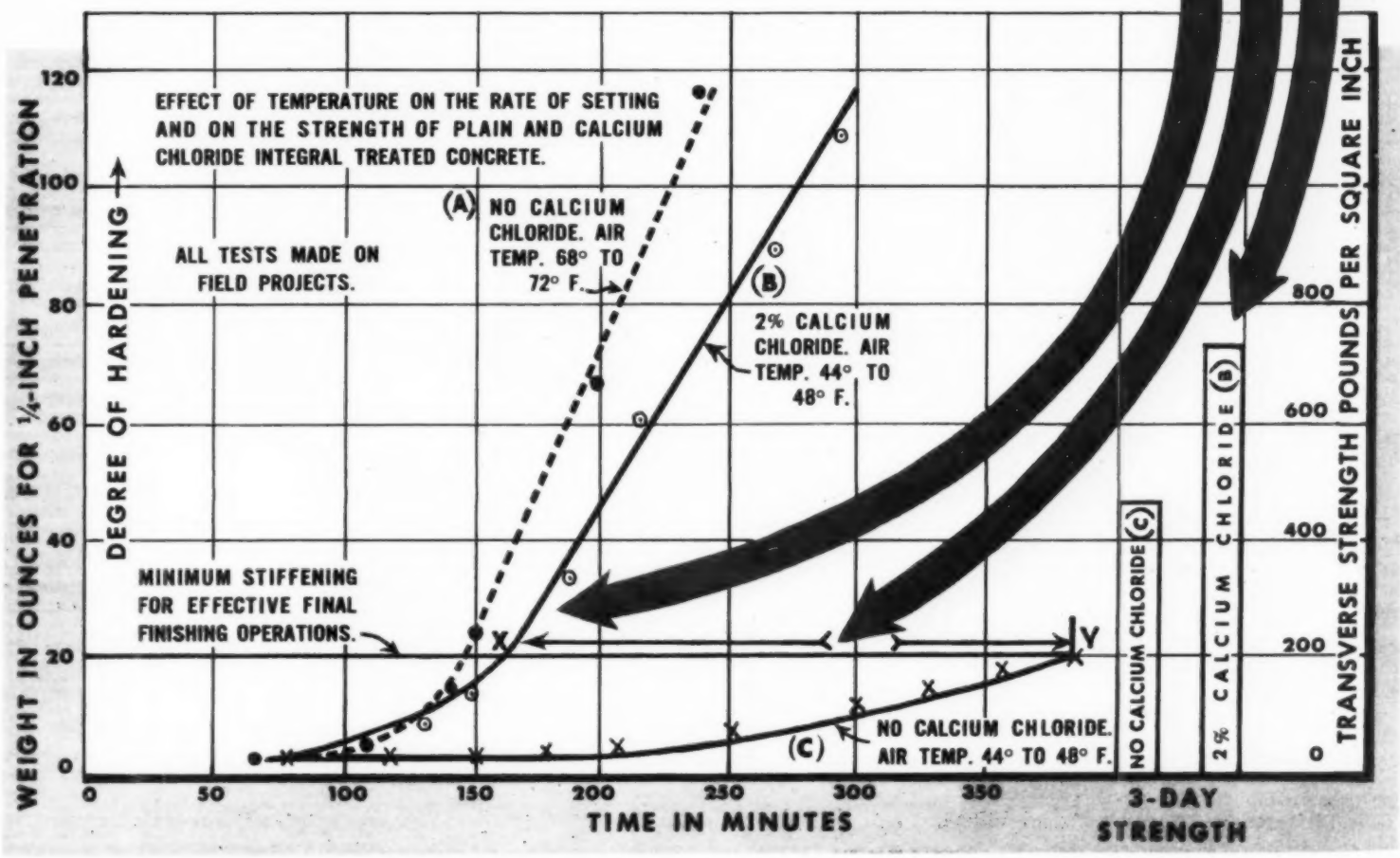

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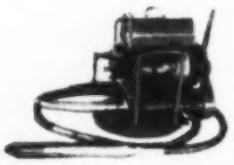

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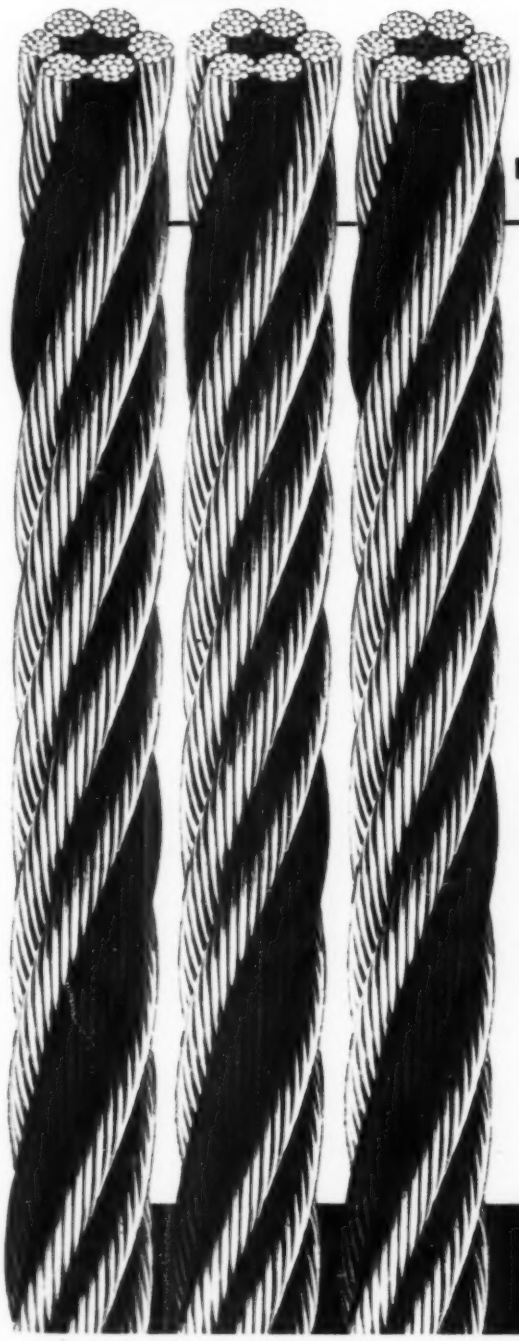

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